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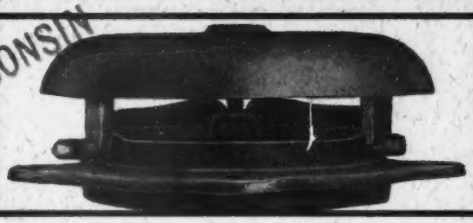

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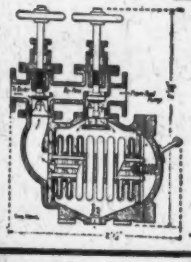

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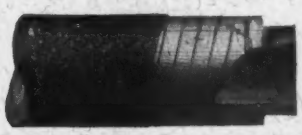

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK MAY, 1911

A House with Radiators on Inside Walls

A scheme for placing the radiators in a building on the inside walls, with resultant saving in the amount of piping needed, was described at the recent meeting of the Heating Engineers' Society by F. K. Davis, of Baltimore. According to tests of the system made by Mr. Davis, the rooms were not only comfortably heated, without undue window drafts, but, in a similar case, radiation so located showed a considerably higher efficiency than that ordinarily obtained when placed near outside windows.

The general layout of the system is shown in Fig. 1. This house, said Mr. Davis, is fairly typical and is of the ordinary frame construction, having been built about ten or twelve years ago. The ceilings of the basement are not plastered, but the boiler and piping is covered and the windows are tight.

"You will note," continued Mr. Davis, "that there is very little outside wall space that is not taken up by windows. The window sills are about 10 in. above the floor, the tops running to within 8 in. of the ceiling. There was so little wall space in the room for radiation that, as a final solution, we put it at the points indicated in Fig. 1.

"This installation has gone through two winters in which the lowest temperature, I think, has been in one case 8° F. below zero, and in the other 3° F. below zero. The owner of the house tells me that never on any occasion has it been necessary to exceed a water temperature in his boiler of 145° F. to heat his house comfortably, which means usually in excess of 70° F.

"The proportion of heating surface in this house, assuming 4 sq. ft. of wall to be equal to 1 sq. ft. of glass surface, is a little less than 1 sq. ft. of radiation to each 2 sq. ft. of glass. When I first mentioned this installation, immediately the question was raised that there were cold drafts across the floor and that this in itself would condemn the method. One day I visited the house, taking with me an anemometer calibrated flat to 200 and very sensitive. I experimented with the anemometer on the floor to see if there was a perceptible draft across the floor. In no case could I get draft enough to start the wheel of the anemometer with the gear out. Thermometers hung from the chandelier, one at the breathing line and one about 4 to 6 in. above the floor, showed a differential of less than 2° F., indicating that there was not any perceptible cold draft across the floor. The outside temperature was about 30° F. and the wind velocity about 12 miles an hour, from the northwest. There was no test made of the temperature directly in front of the windows, nor were there any measurements made

of the air going up through the fireplaces. I presume there were currents of air there.

HIGHER EFFICIENCIES OF RADIATORS ON INSIDE WALLS

"In this same general connection, I happened to be taking part in some tests in Baltimore on ten houses which were identical. In some of the houses the radiation was placed a little bit different from that

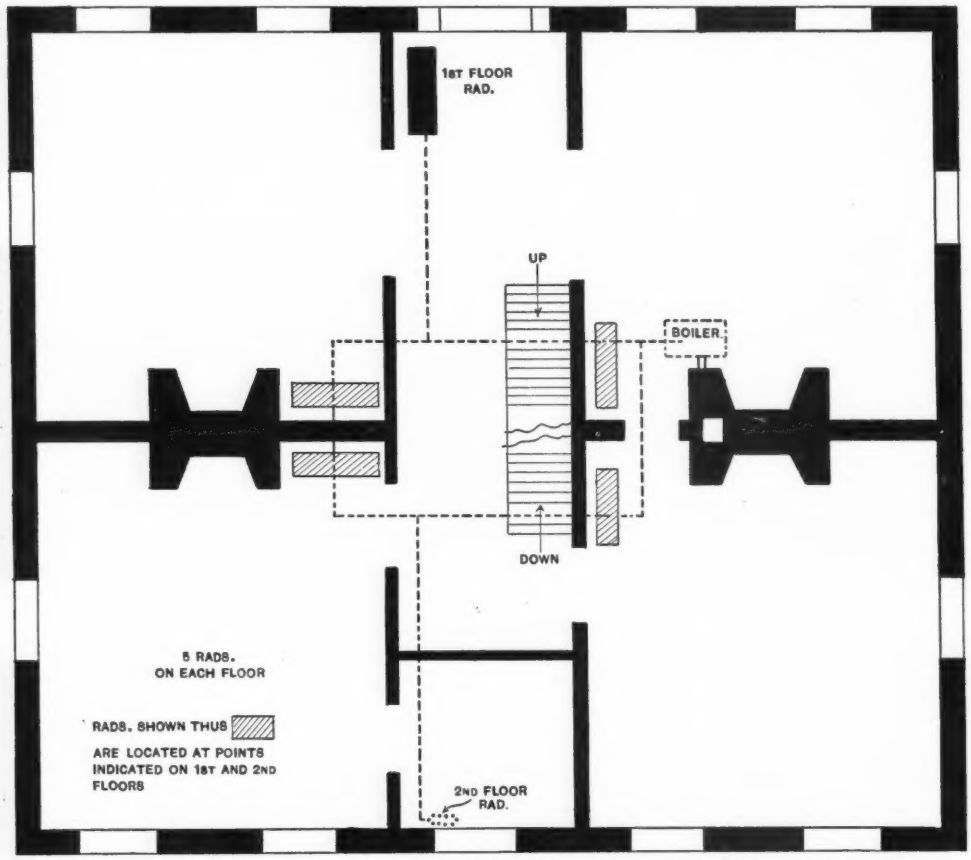


FIG. 1—ARRANGEMENT OF HEATING SYSTEM IN HOUSE WITH RADIATORS ON INSIDE WALLS

in the others. I spent practically two weeks in those houses at work on a theory that there seemed to be an error in the so-called coefficient for the transmission of heat from radiators. We base our coefficients usually at 1.7 B. T. U. per degree difference.

"Now, I have never been able to find the air in contact with the radiator as low as 70° F. The lowest temperature I ever got was 84° F. That was on a radiator where the boiler temperature was about 135° or 140° F. The air in contact with the radiator has varied from 84° F. to as high as 120° F. on a steam radiator where the temperature of the steam was 215° F."

MR. CESAR TERAN: "I would like to know the method that was used to obtain the temperature of the air in contact with the radiators."

MR. DAVIS: "Thermometers were hung at the points shown in Fig 2, so that the approximate clearance between the iron and the thermometer was from ¼ in. to ⅛ in. Then we kept on right out at right-angles ½ in. apart till we got further out, where the thermometers were probably spaced 1 in. apart. We used six or eight thermometers in the same line.

"The general belief is that a thermometer placed near a heated sur-

face is affected by radiant heat, but I found in every case where I put a paper tube around the bulb of the nearest thermometer, the temperature would immediately rise, showing that there was more refraction than absorption of the heat by the bulb of the thermometer.

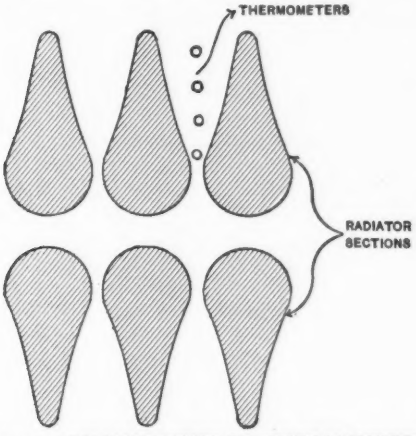


FIG. 2—ARRANGEMENT OF THERMOMETERS FOR DETERMINING TEMPERATURE OF AIR IN CONTACT WITH RADIATOR

"The high temperature I observed in the air next to the radiator indicated to me that there is something wrong with the accepted coefficient. Some of the radiators in the building in question were on the outside walls, some at right-angles to cold walls and a few of them placed under the windows. I found uniformly that the radiators under the windows gave a higher temperature of air in contact with the radiator. Those on the cold walls would most nearly approach them. Those that were placed at right-angles to the cold walls seemed to prove the matter, from the fact that the different sections would be higher in temperature nearer the cold wall. As we got away from the cold wall the temperature of the air would drop, until when 2 or 3 ft. away from the cold wall we got the same result that we would get on the radiator placed entirely on the warm wall.

Now, the proportion of heat transmitted by a radiator is proportional to the temperature of the cooling medium or air in contact with the radiator; so that it seems to show conclusively that the radiator on the warm wall is more efficient and transmits more heat than the radiator placed on the cold wall or under a window."

Use of Cold Air in Ventilating Systems

That it is not only possible, but preferable and economical, to admit fresh air into a room without warming, is a proposition recently advanced by the Hackney Ventilating Co., of St. Paul, Minn., which will be gone into at length in a new booklet on the subject, shortly to be issued. To admit such cold air for ventilating purposes the writer will say that it is necessary to locate the inlets 8 ft. or more from the floor and have them of such size and number that only a comparatively small quantity of air will be admitted at each inlet, this quantity being dependent upon the height, not only of the inlet, but of the ceiling.

To illustrate: If inlets be located on or near a 10-ft. ceiling, they should each be limited to about 4,000 cu. ft. of air per hour, while, if the height be increased to 16 ft. the air capacity of each inlet may safely be doubled. Where ceilings are abnormally high, the air may be carried up 20 to 25 ft. and inlets provided with a capacity of 20,000 cu. ft. per hour, with no danger of drafts.

"Now, let us consider carefully," continues the writer, "the result of admitting air into a room without warming. It is a matter of common knowledge that the temperature at the ceiling is always higher than at the floor. Admitting cool air well up from the breathing line, it immediately assumes a downward course, due to gravity, and, as it descends, is thoroughly warmed by the ascending

movement of heated air from radiators, stoves or hot-air registers. The law of diffusion causes both the cool and warm air to spread, while on their downward and upward courses, respectively, with the result that, instead of forming an objectionable down draft, as might be expected, the air assumes a comfortable temperature by the time it reaches the breathing line.

"This method produces a quality of ventilation that is extremely refreshing and can only be appreciated by those who have enjoyed its benefits. The laws of diffusion and gravity are coöperated with, rather than ignored, and the air is not expected to form in currents and travel about the room, according to the desires of the designer.

"This mixing of cool and warm air gives a circulation that is impossible when the air is admitted warm. Not only does this method afford better ventilation, but it offers a number of economic advantages. In the original cost there is a great saving in omitting master coils, and in the maintenance, another saving is effected by eliminating entirely the loss of heat while the air is in transmission from the coils to the inlets and also by using the heat at the upper part of the room for warming the incoming air.

LOCATION OF FOUL AIR OUTLETS

"The proper location of the foul air outlets has been discussed extensively. The writer believes the matter can be settled for all practical purposes by saying that in a room where there is no circulation of air the impurities will settle to the floor, about 85% being found in the lower half of the room, and the remaining 15% in the upper half. However, it does not follow that to remove these impurities it is necessary to locate the outlets near the floor. If the air be put in circulation the impurities will be found at the ceiling as well as at the floor. In fact, they will be pretty generally distributed in all parts of the room, and it will matter but very little where the outlets are located. Where the air is admitted into the room cold the outlets may be located at the ceiling without fear of wasting much heat, and in cases where smoke, light gases, odors or excessive heat are to be removed, the ceiling is the only logical location for the outlets. It is sometimes advisable to have outlets both at the ceiling and the floor, and to have them adjustable, so that either may be used, or both, as occasion demands.

"The fact should be emphasized that ventilation is a process of dilution. Fresh air does not come in and displace foul air, but mixes with it, and it is this mixture which is drawn out. It is not necessary to provide as many outlets as inlets, as a considerably quantity of air may pass out through one opening without causing a perceptible draft.

"Where cold air is furnished for ventilating purposes, the location of the blowers should be in the attic or in a pent-house on the roof. This location offers several advantages. In the first place, the operation of the plant will be in harmony with nature's laws, as the colder air will flow downward and the warmer air upward. By this method the expense of air stacks may be saved, as the blowers will be within a few feet of the outside air. Space is used which is of no value for any other purpose, and a further saving can generally be effected by carrying the main supply lines through the attic rather than in the basement."

No heating system can possibly succeed that maintains an even temperature. I know how that hits many accepted theories. We are changeable creatures and we need the stimulus of cold air occasionally. To keep fresh the air about the body and clothing is as important as to keep pure the air that enters the room. So there is no best temperature. We all need a change of temperature.—*Dr. Luther H. Gulick before the Heating Engineers' Society.*

Factory Sanitation and Efficiency

By C. E. A. Winslow

An appeal for good air, of proper temperature and humidity, in factories, when based on economic grounds, is undoubtedly the most effective means of securing favorable action on the part of the owners. Such an appeal is made in a paper read before the recent Congress of Technology in Boston, by Professor C. E. A. Winslow, associate professor of biology in the College of the City of New York and curator of public health, American Museum of Natural History, New York.

Professor Winslow pointed out in the beginning of his paper the fact that humidity and temperature conditions in factories, though they profoundly affect the efficiency of the workmen, have received very little attention from the manufacturer himself, and this little almost wholly under the compulsion of State laws. "For the moment," said Professor Winslow, "I am quite frankly and coldly treating the operative as a factor in production whose efficiency should be raised to the highest pitch, for his own sake, for that of his employer and for the welfare of the community at large.

"The intimate relation between the conditions which surround the living machine and its efficiency is matter of common experience with us all. Contrast your feelings and your effectiveness on a close, hot, muggy day in August and on a cool, brisk, bright October morning. Many a factory operative is kept at the August level by an August atmosphere all through the winter months. He works listlessly, he half accomplishes his task, he breaks and wastes the property and the material entrusted to his care. If he works by the day the loss to the employer is direct; if he works by the piece the burden of interest on extra machinery has just as truly to be borne. At the close of the day the operative passes from an overcrowded, overheated workroom into the chill night air. His vitality lowered by the atmosphere in which he has lived, he falls a prey to minor illness, cold and grip, and the disturbing effect of absences is added to inefficiency. Back of it all lurks tuberculosis, the great social and industrial disease which lays its heavy death tax upon the whole community after the industry has borne its more direct penalty of subnormal vitality and actual illness.

"The remedy for all this is not simply ventilation in the ordinary sense in which we have come to understand the term. Conditioning of the air so that the human machine may work under the most favorable conditions,—this is one of the chief elements of industrial efficiency as it is of individual health and happiness.

"The chief factors in air conditioning for the living machine, the factors which in most cases far outweigh all others put together, are the temperature and humidity of the air. Heat, and particularly heat combined with excessive humidity, is the one condition in air that has been proved beyond a doubt to be universally a cause of discomfort, inefficiency and disease. Flugge and his pupils in Germany and Haldane in England have shown that when the temperature rises to 80° F. with moderate humidity, or much above 70° F. with high humidity, depression, headache, dizziness and other symptoms associated with badly ventilated rooms begin to manifest themselves. At 78° F., with saturated air, Haldane found that the temperature of the body itself began to rise. The wonderful heat regulating mechanism which enables us to adjust ourselves to our environment had broken down and an actual state of fever had set in. Overheating and excess of moisture is the very worst condition existing in the atmosphere, and the very commonest.

"The importance of the chemical impurities in the air has dwindled rapidly with the investigations of recent years. It was long believed that the carbon dioxide was an index of some subtle and mysterious 'crowd poison' or 'morbific matter.' All attempts to prove the existence of such poisons have incontinently failed. Careful laboratory experiments have quite failed to demonstrate any unfavorable effects from rebreathed air if the surrounding temperature is kept at a proper level. In exhaustive experiment by Benedict and Milner (Bulletin 136, Office of Experiment Station, U. S. Department of Agriculture), seventeen different subjects were kept for periods varying from three hours to thirteen days in a small chamber with a capacity of 197.6 cu. ft. in which the air was changed only slowly while the temperature was kept down from outside. The amount of carbon dioxide was usually over 35 parts (or eight to nine times the normal), and during the day when the subject was active it was over 100 parts, and at one time it reached 231 parts. Yet there was no perceptible injurious effect.

"The main point in air conditions is, then, the maintenance of a low temperature and of a humidity not too excessive. For maximum efficiency the temperature should never pass 70° F. and the humidity should never be above 70 per cent. of saturation. At the same time, a too low humidity should also be avoided. We have little exact information upon this point, but it is a matter of common knowledge with many persons that very dry air, especially at 70° F. or over, is excessively stimulating and produces nervousness and discomfort. It would probably be desirable to keep the relative humidity between 60 and 70 per cent.

"Another point which may be emphasized in the light of current opinion is the importance of 'perflation,' or the flushing-out of a room at intervals, with vigorous drafts of fresh, cool air. Where there are no air currents the hot, moist, vitiated air from the body clings round us like an 'aerial blanket,' as Professor Sedgwick calls it, and each of us is surrounded by a zone of concentrated discomfort. The delightful sensation of walking or riding against the wind is largely due, perhaps, to the dispersion of this foul envelope, and it is important that a fresh blast of air should sometimes blow over the body in order to produce a similar effect. The same process will scatter the odors which have been noted as unpleasant and to some persons potentially injurious. The principal value of the carbon-dioxide test to-day lies in the fact that under ordinary conditions high carbon dioxide indicates that there are no air currents changing the atmosphere about the bodies of the occupants.

"There is plenty of evidence, though, of a scattered and ill-digested sort, that the elimination of such conditions as these brings a direct return in increased efficiency of production."

Oxygen is not nearly so important as has been generally supposed. There is an apparatus in the back part of the human brain which controls respiration, so that within such a variation of oxygen as occurs, even in the worst-ventilated room, the amount of oxygen used by the individual does not vary at all, so far as is shown by the most accurate experiments it has been possible to make. If there is 18 per cent. of oxygen in the air, you extract from it just as much as if there were 21 per cent., which is the normal amount. If, by artificial means, the amount of oxygen is made to fall below 15 per cent., this regulating apparatus which makes you breathe faster when there is less oxygen in the air is not adequate to overcome the obstacle.—*Dr. Luther H. Gulick before the Heating Engineers' Society.*

Air Conditioning in Industrial Work

I.—REGULATION OF HUMIDITY IN PAPER MILLS

By Alexander H. Twombly

Editor's Note.—The necessity for controlling the humidity in connection with certain classes of manufacturing has opened up a field of engineering with which heating and ventilating engineers may well become more familiar. The present article, which appeared in Paper, is the first of a series we will publish which will discuss the peculiar conditions to be found in each industry, and practical measures that may be taken to meet such conditions.

The machine-rooms of a paper mill require special and scientific methods of ventilation owing to the large amount of moisture given off by the drying paper. This moisture amounts to about 150% of the weight of the dry paper, as the sheet of paper leaving the presses and going to the dryers contains about 60% water. That is, if the paper machine produces 24 tons of paper in 24 hours, the amount of moisture driven off into the air from the dryers will be about 36 tons during the 24 hours.

When not properly cared for this moisture will result in a foggy, moist room with a continual dropping of moisture due to condensation on the roof, pipes and walls, which will spot the paper, and the temperature and humidity of the air will make the room most uncomfortable for the operatives. If colder air from the outside obtains entrance through cracks, windows or doors, the drop in temperature will cause the interior of the room to be filled with fog and rain.

It is not unusual to find the paper machines entirely hooded to keep the moisture from spreading into the room, and a large exhaust fan operating at the top of the hood to carry away the vapor from the dryers. The hood interferes, however, with the operation of the machine, the light, the removal of broken paper, the replacing of dryer felts, and the handling of repair parts, and collects dirt. This is especially true when the quality of the paper is such that frequent breaks occur upon the dryers, and when the machine operates at a high speed.

Disc fans for ventilating are frequently placed in the roof or in dormer windows to carry away the moist air. These fans are not positive enough in their action, taking the air which comes to them only, and not creating a definite current. Unless warm air is made to flow over the machine directly to these fans they do not successfully accomplish the necessary ventilation. A strong wind against a disc fan almost entirely prevents its action. If warm air from an outside source is not supplied in sufficient quantity to the machine-room, the sudden opening of a door will cause an enormous temporary draft from the outside, which in cold weather will make a cloud of vapor and fog inside the room.

Another method of ventilation of machine-rooms frequently found is the installation upon the roof over the dryers of a number of ventilators acting by gravity. Their operation, however, depends so much upon atmospheric conditions that their action cannot be depended upon, for it is absolutely essential that a constant supply of warm air should be furnished and removed from the machine. In large mills this air supply is often drawn from other parts of the mill through open doors, but such means are not constant enough under all weather conditions to be satisfactory.

CONSTANT SUPPLY OF AIR REQUIRED

Proper ventilation can only be accomplished by removing the moisture through a constant supply of air which forms a carrier for the moisture from the paper on the dryers, regularly furnished and re-

moved by mechanical means. The capacity of the air to act as a carrier should be as carefully determined as that of a chip conveyor or water supply pipe.

The conditions in each case admit of exact figuring, for there is a definite amount of water contained in the air when saturated for each degree of temperature, and the amount of moisture increases as the air temperature increases. A cubic foot of air, when saturated, contains about fourteen times as much moisture at 170° F. as at 70° F. But a cubic foot of air, when saturated, if heated from 70° to 170°, on account of its increased volume and temperature, will contain, if saturated, about twenty-seven times its initial moisture. The quantity of air which must be supplied, its temperature, the heating surfaces required to produce the necessary temperature, and the velocity of the air about the dryers, and its method of admittance and removal, are all subject to exact mathematical determination.

DRYERS USED AS HEATING SURFACE

The important part which the surfaces of the dryers, uncovered by the sheet of paper, play in the problem of drying is seldom recognized. A careful study of general conditions indicates that at least one-fifth to one-fourth of the dryer surface should be used in heating the air which carries away the moisture from the dryers, and that the remaining dryer surface should be utilized for the direct vaporization of the moisture in the sheet of paper. The uncovered ends of the dryer cylinders form important air heating surfaces. It is essential that a sufficient supply of air to carry away all the water evaporated, without approaching the saturation point, should be supplied and that the temperature of this air when laden with moisture should not be allowed to cool so as to become saturated before its removal, for in that case a fog and rain immediately result inside the machine-room.

DESIRABLE CONDITIONS IN MACHINE-ROOMS

The following will show conditions desired in the machine-room:

The machine should be unobstructed by hoods or coverings which interfere with the operation or the removal of broken paper, or the renewal of dryer felts or repair parts.

The air in which the operatives work in the machine-room should be at a temperature not exceeding 80°, and without undue humidity.

The moisture from the drying paper should be removed without condensation or dripping, and the roof, walls and pipes are to be free from condensation. This condition is to be maintained independently of outside weather conditions.

To obtain these results the roof conditions above the machine are important. There should be as few obstructions from beams or trusses as possible and there should be no pockets. The roof, on account of its large exposed surface, plays a very important part in the precipitation of moisture. It acts as a cooler, and when the moisture laden air at a higher temperature is allowed to come in contact with it, condensation ensues.

The condensation soon rots the roof, and its dripping is a great source of injury to the paper and annoyance to the men. To overcome this difficulty of condensation, it has been customary to place the outlets of exhaust fans or hoods at some distance below the level of the roof in order to draw out the moisture laden air before it reaches the roof, and to try to prevent condensation on the roof by heating the layer of air between the exhaust outlet and the roof with steam circulation coils.

This method has proved inefficient, as the dead air above the circulation coils soon becomes saturated with moisture, which is deposited upon the beams and roof. The steam circulation pipes are also a constant source of annoyance

through leaks and collection of dirt. The roof area is usually large in proportion to that of the walls, and the radiation from the roof is, therefore, the main factor in condensation troubles.

HEATED AIR JETS FOR PREVENTING CONDENSATION AT ROOF

To prevent this condensation, and to preserve the roof, the proper method is to keep the air between the outlets of the exhaust fans and the roof at a high temperature and in constant motion, carrying off with it any moisture which may have a tendency to be deposited upon the roof. This is accomplished by heated air jets wiping across the surface of the roof at a high velocity and entirely preventing condensation. In this way it is possible to keep the roof in a perfectly dry condition, and to prevent any moisture laden air which may pass upward, and by the exhaust outlets, from coming in contact with the roof. The air jets at the same time keep the air free from dust coming from the surface of the paper, and prevent deposits of dirt upon the beams. The circulation pipes, almost universally used and a constant source of trouble, are entirely eliminated; there is no longer need of umbrella hoods over the machines, and the machine is well lighted and free for inspection.

The air supply for a machine-room should be drawn from an outside source through a heating coil by a steel plate fan. The coils should be arranged in sections controlled by independent valves so that the temperature of the air can be properly regulated to produce a temperature in the machine-room of about 80° F. Sufficient air should be delivered at many points well distributed in the machine-room, by the fan to maintain a slightly greater pressure in the machine-room than that of the outside atmosphere, so that cold air from the outside is prevented from entering and all leakage of air through doors, windows and walls is outward.

Above the machine at the front and back of the dryers should be a series of fan-shaped exhaust outlets connected with a positive steel plate exhaust fan. By a proper distribution of these outlets it is possible to obtain the flow of the requisite volume of air at all points of the dryers, in proportion to the amount of vapor given off. This is impossible with a disc fan, or with a hood, and with one or two outlets only. These outlets are the only direct outlets for the air in the machine-room, so that all currents of air converge toward the dryers and pass between and by them to the exhaust outlets.

The volume of air admitted to the room, the points of admission, the direction of its flow toward and over the dryers and its upward movements, are matters which require careful and expert consideration. The volume must be sufficient to carry away the moisture from the room under all outside atmospheric conditions. The percentage of relative humidity in the outside air varies so largely that it is necessary to provide a sufficient volume of air to remove the moisture from the room under extreme conditions of humidity in the outside air and without allowing the inside air to reach a point near full saturation. Unless these conditions are carefully considered the results would be, that, while under certain conditions of the outside air a plant might produce ideal conditions in the machine-room, under other outside air conditions it would prove at least a partial failure.

The air passing from the inlet fan toward the dryers is relatively free from humidity and enables the operatives to work in comfort. After reaching the dryers the faces and ends of the dryers uncovered by the sheet of paper heat the air to a high temperature and increase very greatly its moisture carrying capacity. The wiping action of a strong current of heated air removes many times as much moisture as still air

at the same temperature. The vapor given off from the drying paper unites with the air and is carried above the machine and out of the exhaust outlets by the current produced by the inlet fan and exhaust fan, augmented by its own tendency to rise on account of its high temperature. No opportunity is given for the moisture to scatter about the room, and as the temperature is kept above that of saturation no deposit of moisture is possible.

To summarize: Warm air is forced into the machine-room under a slight pressure, preventing all inward leaks of outside air. The air is carried in a constant stream toward and over the dryers, becoming highly heated, and carrying with it the moisture evaporated from the paper to the exhaust outlets above the dryers and immediately removed. Hot air jets along the roof prevent any condensation or dripping. Under these conditions the machine can be operated to its full and most economical drying capacity.

Actual results indicate that each pound of water evaporated from the paper, when the temperature of the paper stock running on the machine is from 40° to 60° F., requires about 1.5 lbs. of steam for heating the dryers and the air. This corresponds to about 2.25 lbs. of steam for each pound of dry paper. Improvements in conditions will do much to prevent the frequent shifting of paper-machine employees, who often work under very trying conditions, which require very active personal effort, and will greatly increase their efficiency.

An Unusual Steam Heating Design

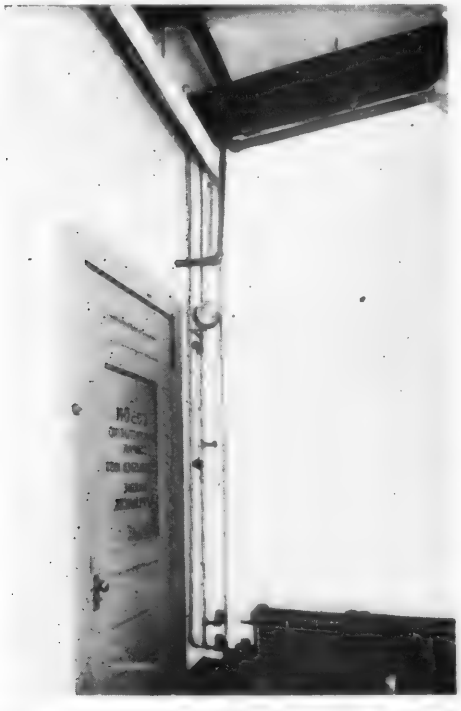
A remarkable example of steam heating efficiency under adverse conditions is that of the remodelled heating system in the six-story building at 255 Atlantic avenue, Boston, Mass. A great deal of difficulty and discomfort had been experienced with this installation due to the peculiar circumstances under which it was forced to operate. The solution arrived at was probably unique for its simplicity, effectiveness and the small outlay necessary to bring about these results.

This building is used for both offices and shops. On the ground floor considerable space is devoted to storage of various heavy and cumbersome materials. There is no steam plant and, therefore, the steam necessary for the heating system has been supplied from the power plant of an adjoining building. The original heating outfit consisted of a one-pipe system receiving its steam supply through pipes laid under the main floor. A considerable part of the latter consists of concrete which was laid around the pipes. From the first, trouble was experienced with the heating system. Most of the radiators are of the wall type and made up of a great many sections while others are merely pipe coils running around the walls of the rooms. With such long radiating units of little height it was impossible to obtain sufficient circulation to insure the entire surface being in action. The one-pipe system proved to be entirely inadequate to furnish a satisfactory amount of heat under the conditions existing. Not only was it impossible to make the steam circulate throughout the radiators but also the occupants were constantly annoyed by water hammer and of course the buried pipes under the first floor caused trouble. Expansion and contraction of these pipes cracked the surrounding concrete and, in addition, it was impossible to get at them for repairs or alterations. To make matters worse, leaks were not long in developing in the concrete-housed piping and this further crippled the heating outfit.

It was finally decided to abandon

the one-pipe system and to apply a vacuum system to the building, using as much of the old piping as possible in order to avoid expense. To this end, the old air pipes were utilized for the return lines of the new two-pipe system, although these were no larger than ½ in. and, in some cases, only ⅜ in. The supply side of the equipment was left unchanged, but on the discharge end each radiating unit was equipped with a Webster water seal motor, permitting the escape of water and air and preventing the passage of any uncondensed steam from the radiator into the returns. With this system a positive circulation was secured by the action of the water seal motor combined with a vacuum pump on the return pipe.

In making over this installation the most difficult question to settle was the disposition of the return pipes. To get at the old pipes laid in the floor was impossible without a much greater expense than the job warranted, for not only would it have been necessary to chip out the concrete in which these pipes were completely buried, but on top of this floor were superimposed tons of steel, stored there by some of the shops in the building. The expense of removing all this stock and then chipping away the floor in order to reach the pipes or to lay new ones would have been prohibitive.



RETURNS FROM RADIATOR ON GROUND FLOOR, AS CONNECTED TO RETURN MAINS ON CEILING

At length it was suggested to run the returns of the entire building on the ceiling of the first floor, some 13 ft. above the ground floor level, and to lift the condensation from the radiators on the first story up to this level by the pull of the vacuum pump. This course was adopted with entire success. The return pipe from each main floor radiator was run vertically to the ceiling, where two elbows and a nipple served to connect it to the upper side of the main return pipe which was run horizontally about 6 in. below the ceiling. The accompanying photograph shows a radiator in the ground floor office of the Edson Mfg. Co. having a by-passed gauge glass for observing the lift action, and the connection of the return riser to the main return line at the ceiling. The vacuum pump, located in the adjacent power house, is a 4" x 6" x 7" Knowles single vacuum pump, and maintains a vacuum on the system varying between 10 in. and 15 in. of mercury. A perfect circulation is obtained with the lower vacuum, and no difficulty has been experienced with the extraordinarily high lift of the main floor returns or, in fact, with any part of the heating system. The old steam pipes still remain buried in the concrete floor.

The heating contractors who installed the present layout are Whitten & Jackson, Boston, Mass.

Fuel Tests with House Heating Boilers are described in Bulletin 31, by J. M. Snodgrass, assistant professor of mechanical enginering, Engineering Department Station, issued by the University of Illinois. The bulletin gives the results of 130 fuel tests. The bulletin, we understand, may be had on application to the University of Illinois, Urbana, Ill.

A Reversible Ventilating System for an Auditorium

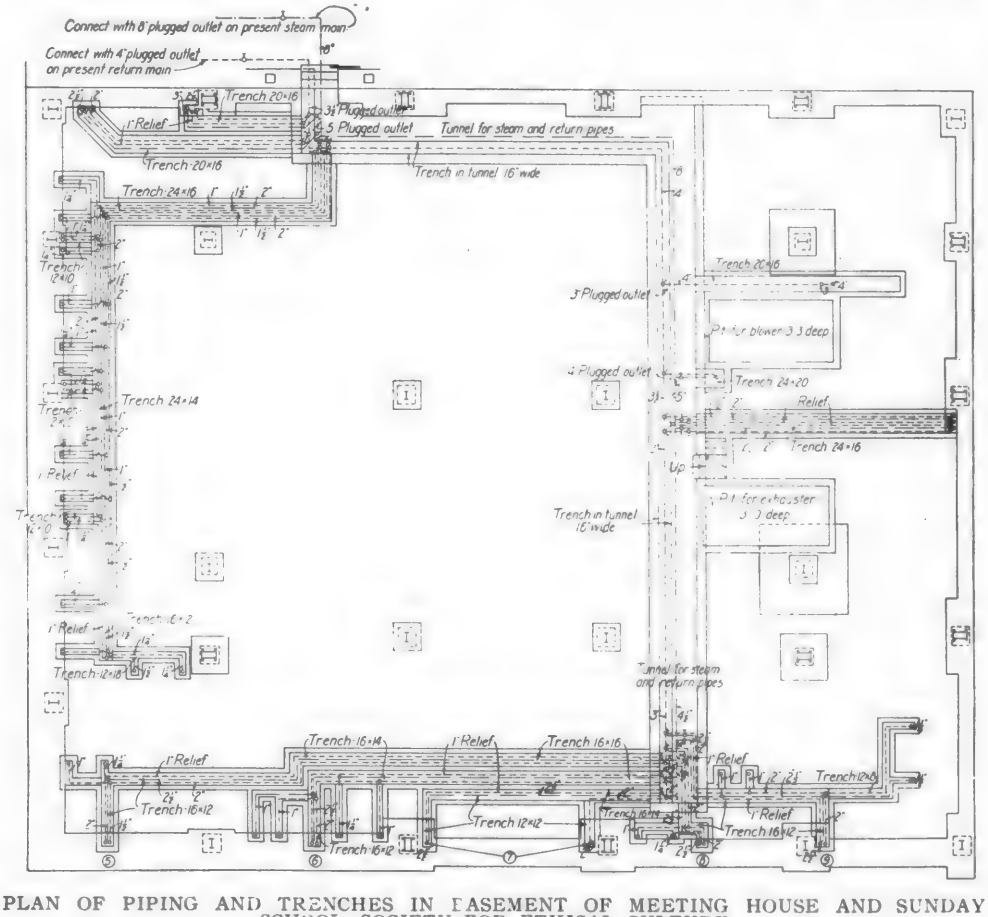
PLANT INSTALLED IN THE SUNDAY SCHOOL OF THE SOCIETY FOR ETHICAL CULTURE, NEW YORK

A comparatively new method of arranging a ventilating system so that, by the turn of a damper, it may be changed from a downward to an upward system, or *vice versa,* is illustrated in the accompanying plans of the Meeting House and Sunday School Room of the Society for Ethical Culture, Central Park West and Sixty-fourth Street, New York.

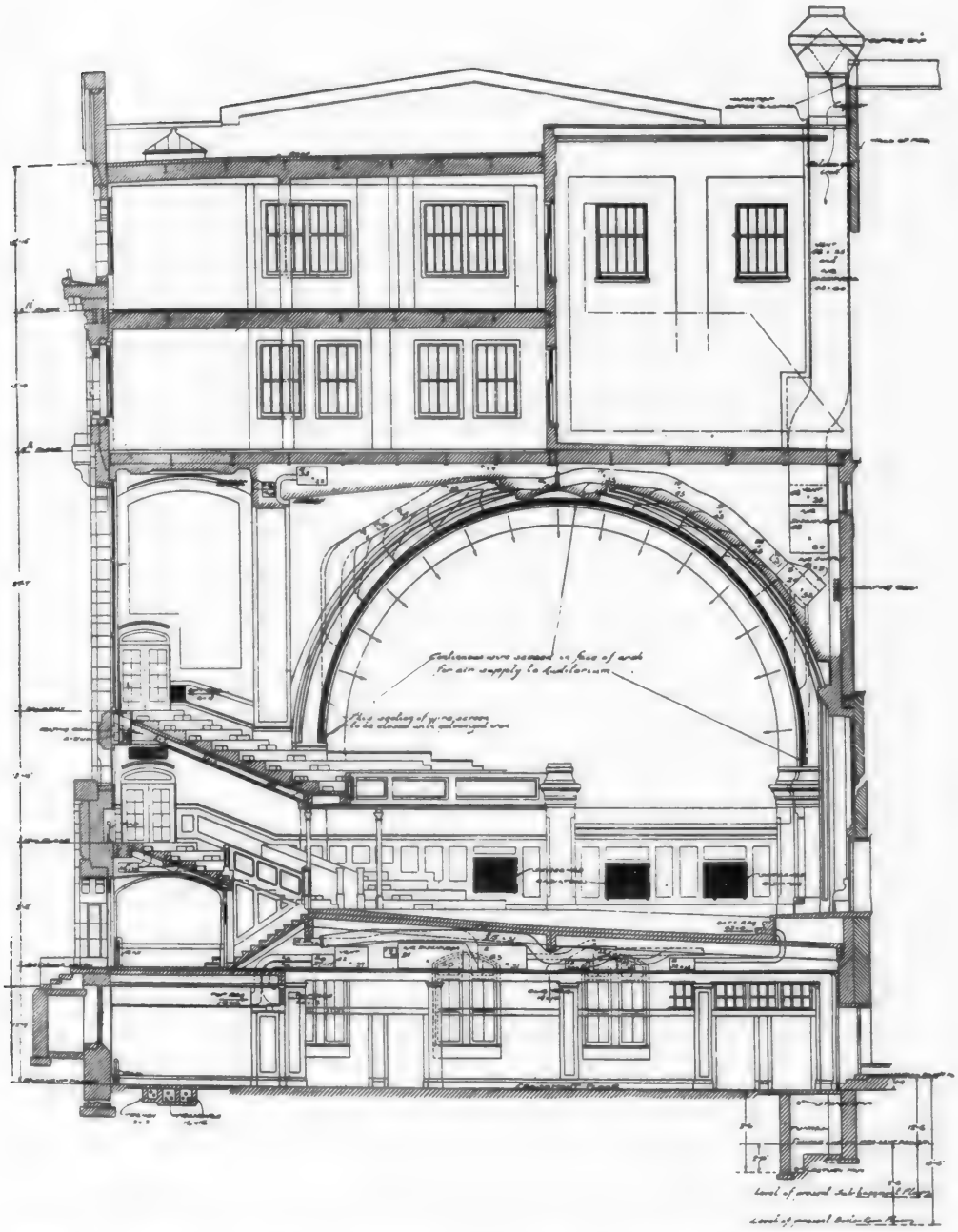
The illustrations show the reversing apparatus in detail, as well as its location in connection with the system itself. The apparatus is arranged to convey the air supply from the blower and the exhaust air to the exhauster in the following manner:

When the reversing damper is set in its regular position, the fresh air supply is conveyed from the blower through the reversing apparatus to the registers and screens near the ceiling, and at the same time the exhaust air is drawn from the registers near the floor through the reversing apparatus and into the exhauster.

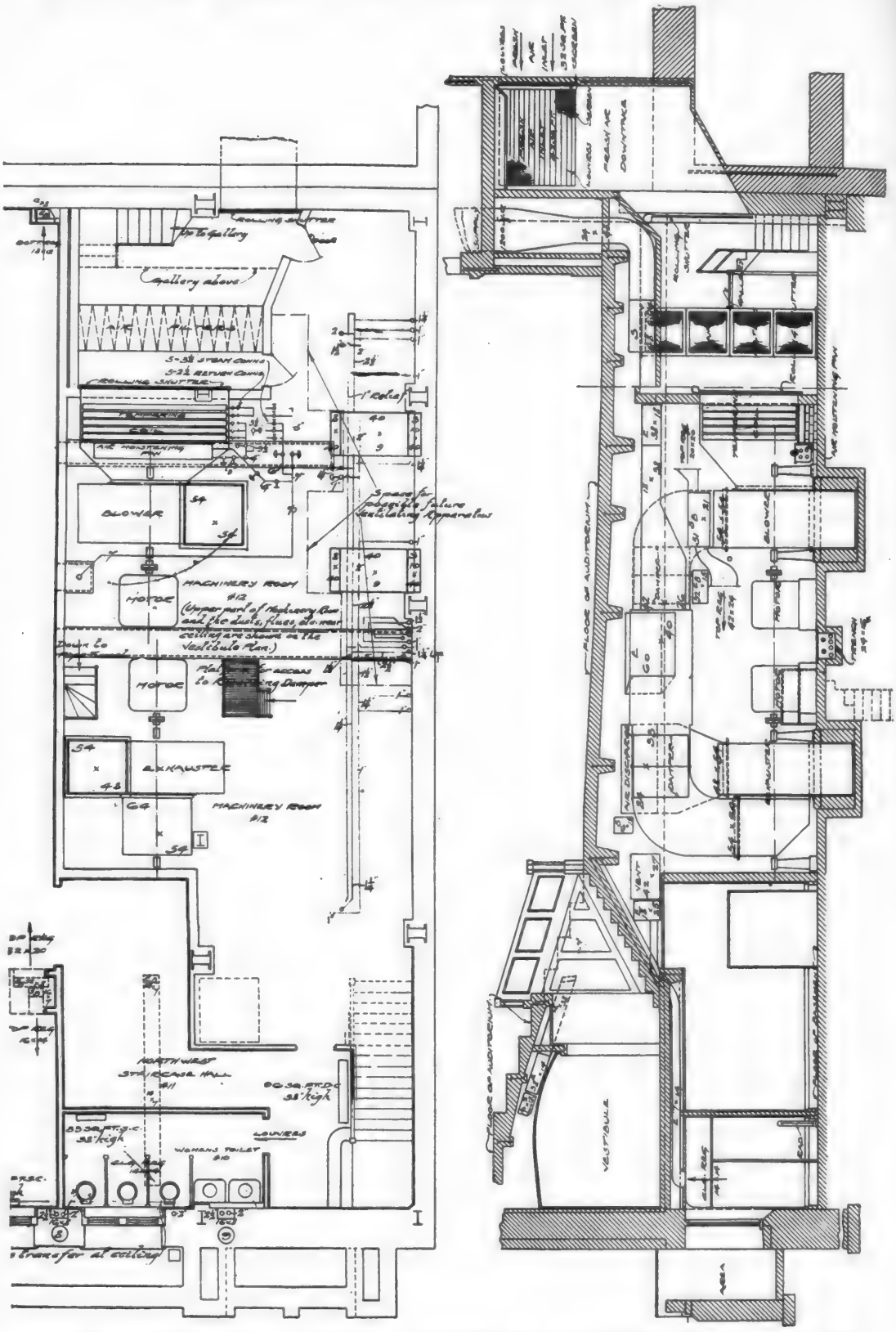
When the damper is set in the reversed position, the air (fresh air supply) is conveyed from the blower through the reversing apparatus to the registers near the floor (ordinarily the exhaust registers) and the exhaust air is drawn from the registers and screens near the ceiling (ordinarily



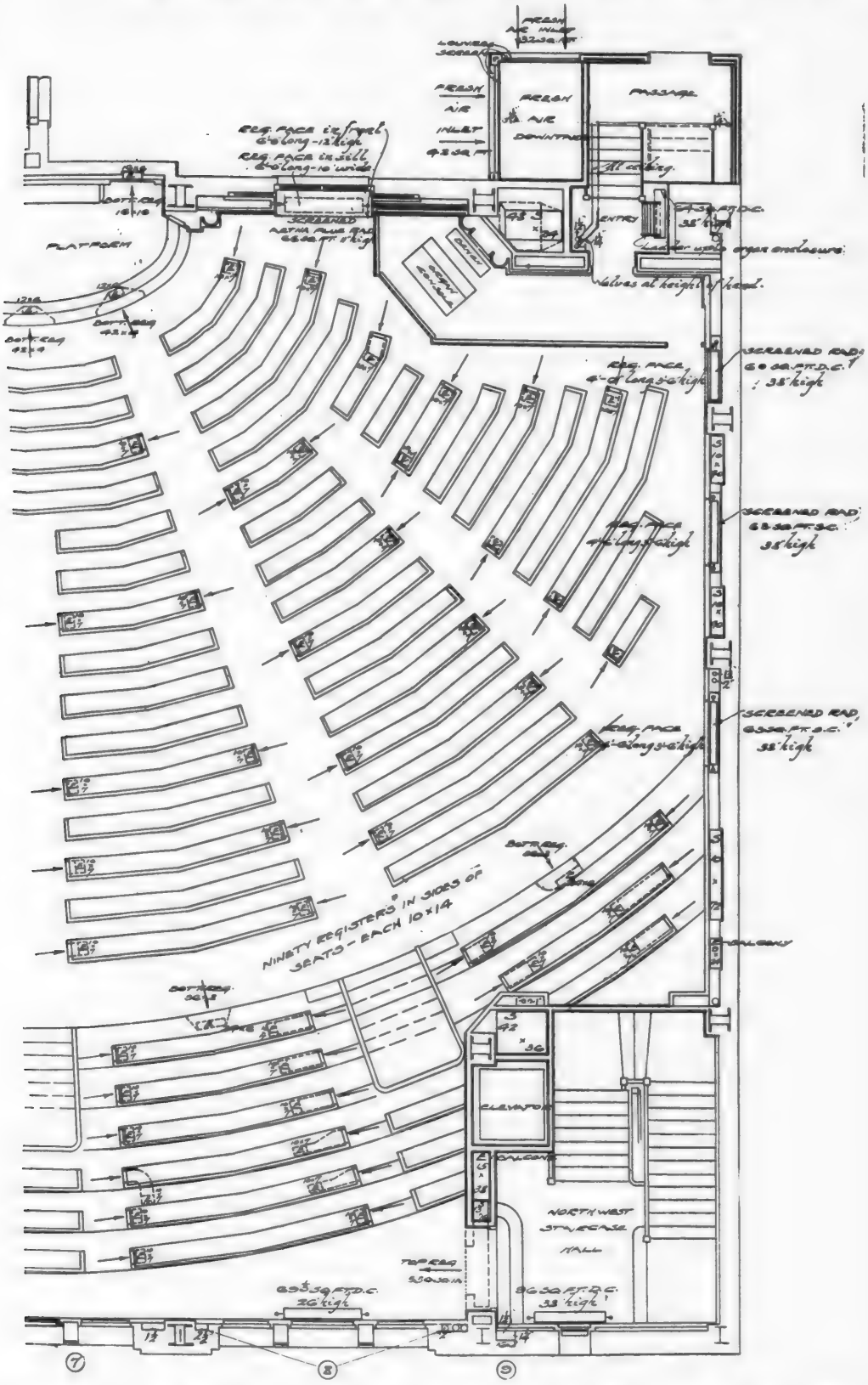
PLAN OF PIPING AND TRENCHES IN BASEMENT OF MEETING HOUSE AND SUNDAY SCHOOL, SOCIETY FOR ETHICAL CULTURE



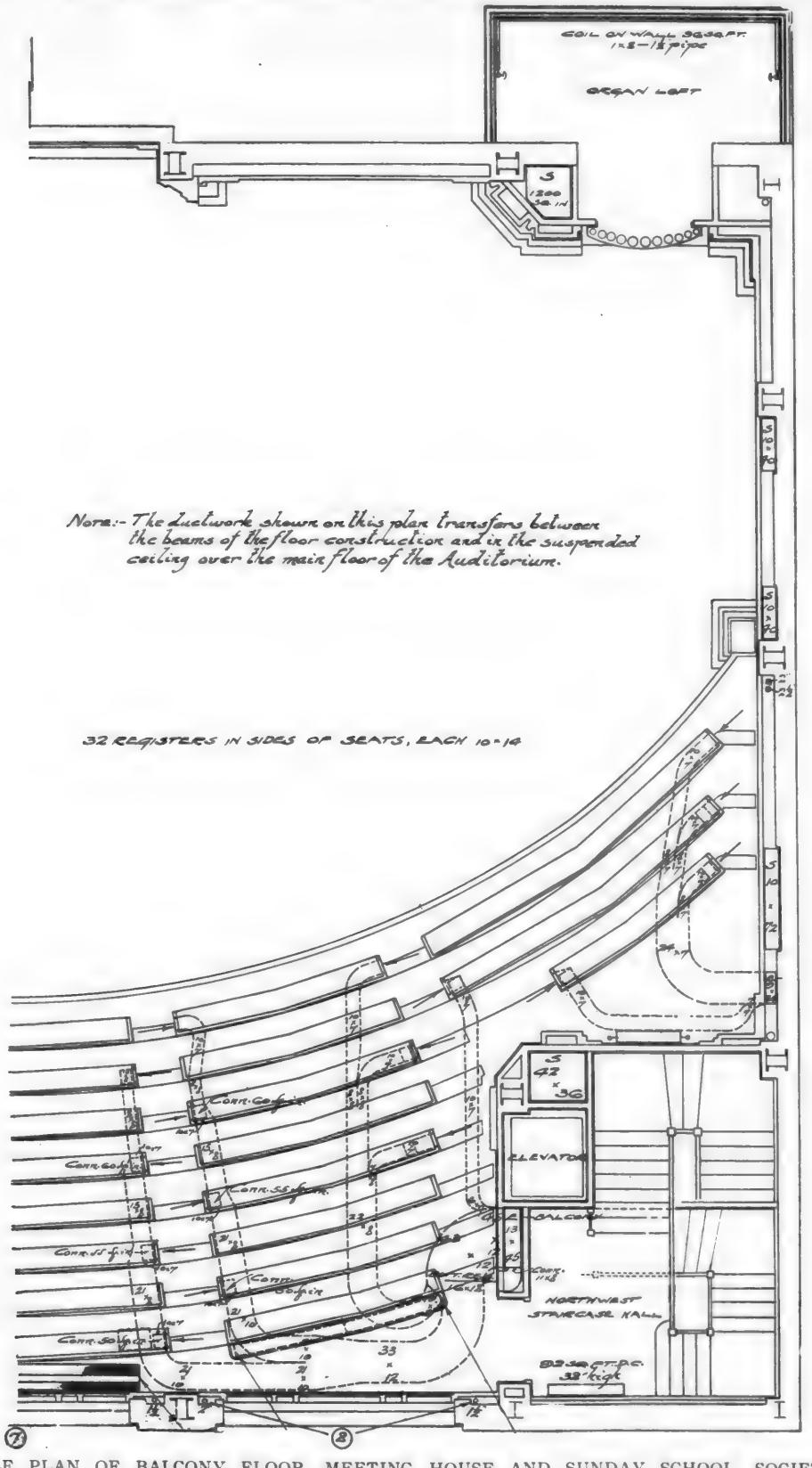
SECTIONAL ELEVATION, MEETING HOUSE AND SUNDAY SCHOOL, SOCIETY FOR ETHICAL CULTURE, SHOWING SCHEME OF HEATING AND VENTILATION



PLAN AND ELEVATION OF PORTION OF BASEMENT, CONTAINING HEATING AND VENTILATING APPARATUS, MEETING HOUSE AND SUNDAY SCHOOL, SOCIETY FOR ETHICAL CULTURE


FRESH AIR INLET
LOUVRES SCREENED
FRESH AIR INLET
FRESH AIR DOWNTAKE
PASSAGE
REG. FACE 12"x12" high
REG. FACE 12" sill 6'-0" long-10" wide
SCREENED
PLATFORM
ENTRY
Ladder up to organ enclosure
Valves at height of head.
SCREENED RAD. 60 SQ. FT. D.C. 38" high
REG. FACE 6'-0" long 9" high
SCREENED RAD. 60 SQ. FT. D.C. 38" high
REG. FACE 4'-0" long 9" high
SCREENED RAD. 60 SQ. FT. D.C. 38" high
REG. FACE 4'-0" long 9" high
NINETY REGISTERS IN SIDES OF SEATS - EACH 10"x14"
BALCONY
ELEVATOR
NORTH WEST STAIRCASE
HALL
TOP REG.
60 SQ. FT. D.C. 26" high
60 SQ. FT. D.C. 38" high

HALF PLAN OF MAIN FLOOR, MEETING HOUSE AND SUNDAY SCHOOL, SOCIETY FOR ETHICAL CULTURE, SHOWING EXHAUST AIR OPENINGS AT ENDS OF SEATS



HALF PLAN OF BALCONY FLOOR, MEETING HOUSE AND SUNDAY SCHOOL, SOCIETY FOR ETHICAL CULTURE, SHOWING VENTILATING SYSTEM

the supply outlets) through the reversing apparatus and into the exhauster. The scheme is similar to that designed by the same engineers for the New Theatre, New York.

The building is heated by direct steam, supplied at about 5 lbs. pressure from the present school building directly adjoining the Sunday School at the north wall. The condensation returns by gravity.

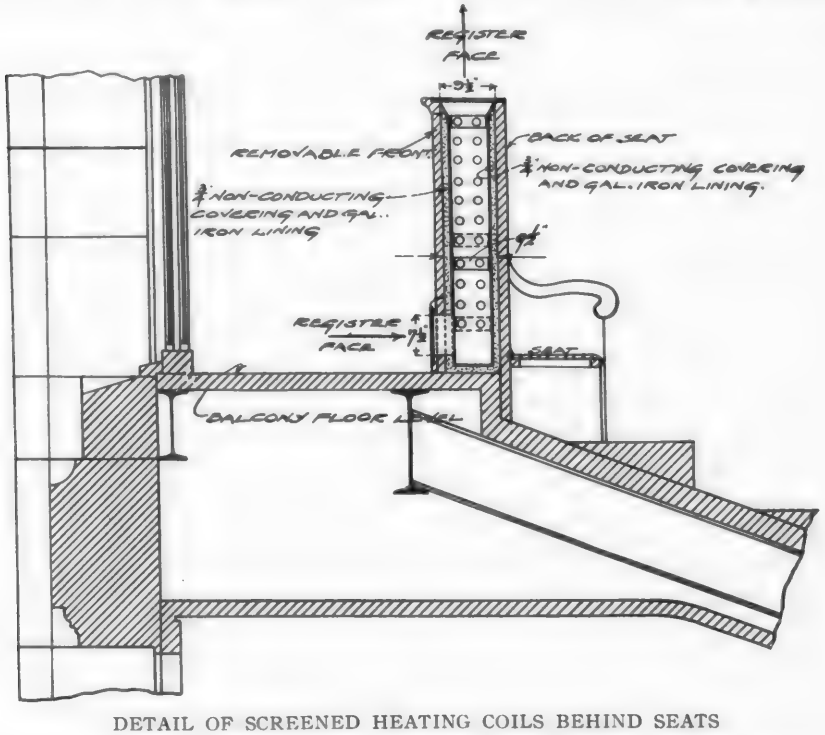
All of the pipe mains are run in trenches on the basement floor. The horizontal return mains are thus run below the water level in the boilers, securing a sealed return.

The ventilating apparatus provides for a tempered fresh air supply and exhaust ventilation for the auditorium and a separate system of air supply and exhaust ducts and flues for the ventilation of the basement, arranged in such a way that the apparatus may be used for the ventilation of either the auditorium or basement.

Included in this apparatus are tempering coil and motors, air supply and exhaust fans and provisions for the future installation of air moistening pans. The air supply fan is of the Sturtevant type, having a wheel 8 ft. in diameter, and is 4 ft. 6 in. wide. The fan for exhaust ventilation is also of the Sturtevant type, having a blast wheel 7 ft. 6 in. in diameter and a width of 4 ft. Both fan wheels have curved blades and are enclosed in full steel-plate housings, extending below the floor level. All the blowers and fans are driven by C. & C. variable-speed motors built especially for the purpose by the Garwood Electric Company.

The tempering coil for the 8-ft. blower has 1515 sq. ft. of heating surface made up of five 2-row sections, 11 ft. wide by 7 ft. high, making a coil 10 rows deep. The sections are made up of 1¼-in. pipe screwed into separate cast-iron headers.

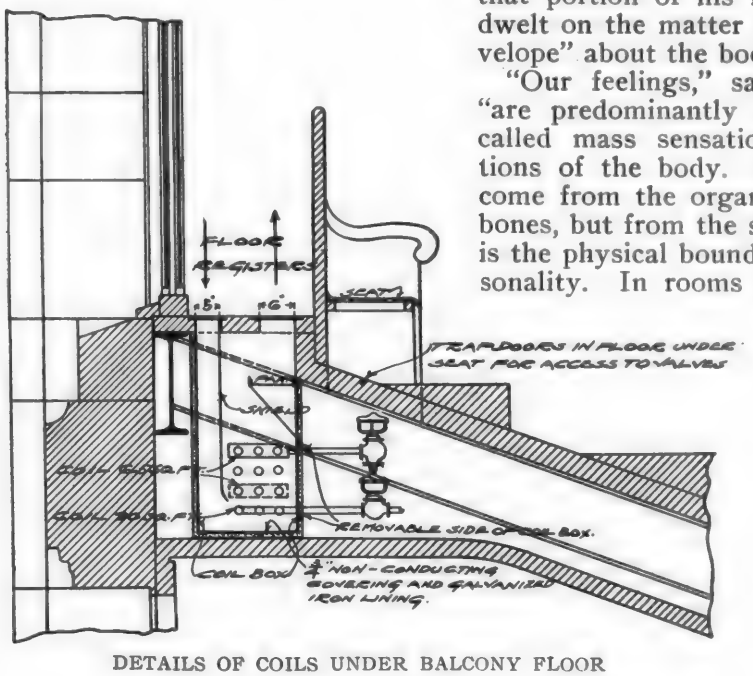
Provision is made in the casing of the tempering coils for the future installation of air moistening apparatus, and swinging doors in the casing provide access to the sections as well as to the air moistener.



DETAIL OF SCREENED HEATING COILS BEHIND SEATS

As will be seen from the illustrations, the reversing apparatus for the ventilating system consists of a heavy steel-plate swinging damper, enclosed

in a reinforced steel casing. The damper can be operated by hand and the operating lever is provided with locking devices for clamping the damper in either position.



DETAILS OF COILS UNDER BALCONY FLOOR

The air enters the downtake shaft near the street level and is drawn through cheese cloth filters located in a gallery forming a fresh air chamber. After passing through the tempering coil the air is moistened and flows through ducts to the various outlets.

The heating system is controlled by the Johnson system of temperature regulation.

The heating plant is equipped with the Paul vacuum system.

The architect of the building is Robert D. Kohn, New York, and the work was designed by Nygren, Tennev & Ohmes, New York. The heating contractors are Baker, Smith & Co., New York.

Ventilation and the Body's Air Envelope

The recent address before the Heating and Ventilating Engineers' Society, of Dr. Luther H. Gulick. director of the Department of Child Hygiene of the Russell Sage Foundation, on the subject of ventilation, has aroused so much discussion in engineering circles that, at our request, he has put into concrete form that portion of his remarks which dwelt on the matter of the "air envelope" about the body.

"Our feelings," said Dr. Gulick, "are predominantly related to so-called mass sensations, the sensations of the body. They do not come from the organs or from the bones, but from the skin. The skin is the physical boundary of the personality. In rooms where the air, even though good, is stationary, the blood-vessels of the skin are dilated and thus the skin is flushed with blood. But the skin should not be so flushed with blood at a time when the brain must be flushed with blood in order to do its work.

"If the air in a room is stationary, that part of the air which comes closest to the body becomes enmeshed in the underwear and so becomes damp and warm. In the endeavor to reduce the temperature the skin starts up a gentle perspiration (because evaporation reduces heat) and the body is enveloped in a warm, moist atmosphere which produces useless perspiration, the air next the body being already saturated. This high temperature and excess moisture cause great restlessness. It is not because school children are overworked mentally, but because the material conditions are such as to demand the preponderance of blood circulation in the

peripheral parts of the body, that children are restless in school.

"Now, open all the windows in the schoolroom, and if you have a plenum system and do not want to throw the children into paroxysms, open all the windows of the building at once and lower the temperature as much as possible in five minutes. During those five minutes have the children walk up and down so fast that they will not catch cold. Then we get the effect of cold impinging against the skin. The layer of damp, moist air has been swept away from the body and a colder layer has taken its place and driven the blood from the surface and it is available again for the brain. This all shows that there are other features in ventilation that are just as important as the purity of the air."

Friction in Steam Pipes When Flow of Steam and Condensation Are in Opposite Directions

The matter of friction in steam pipes when the condensation is flowing in the opposite direction to that of the steam was discussed by James A. Donnelly at the recent annual meeting of the Heating Engineers' Society.

Referring to the illustration, Mr. Donnelly stated that "if the steam is flowing in the pipe in the direction of the arrow, and the condensation is coming in the opposite direction, we expect a reasonable pitch in the pipe. That is probably somewhat exaggerated in the drawing. But it is possible to figure very closely the head of water which must be maintained at Point A in order to balance the velocity head of the flow of steam.

"This is a very nice illustration of the conversion of a velocity-head of steam into a static-head of water. For instance, if the velocity-head is is 16 feet per second, which is higher than one-pipe radiator practice, the head of water at Point A necessary to balance the velocity-head at the bottom would be about 0.03 inches. A smaller head of water would result in the water being blown back until the water accumulated and balanced it. The water would then have to rise somewhat higher in order to flow in the opposite direction. This head of water becomes more serious in pipes of small size, and

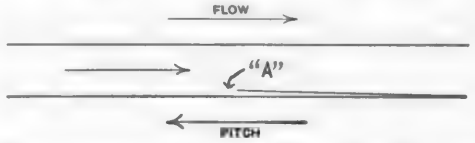


DIAGRAM SHOWING FRICTION IN STEAM PIPES

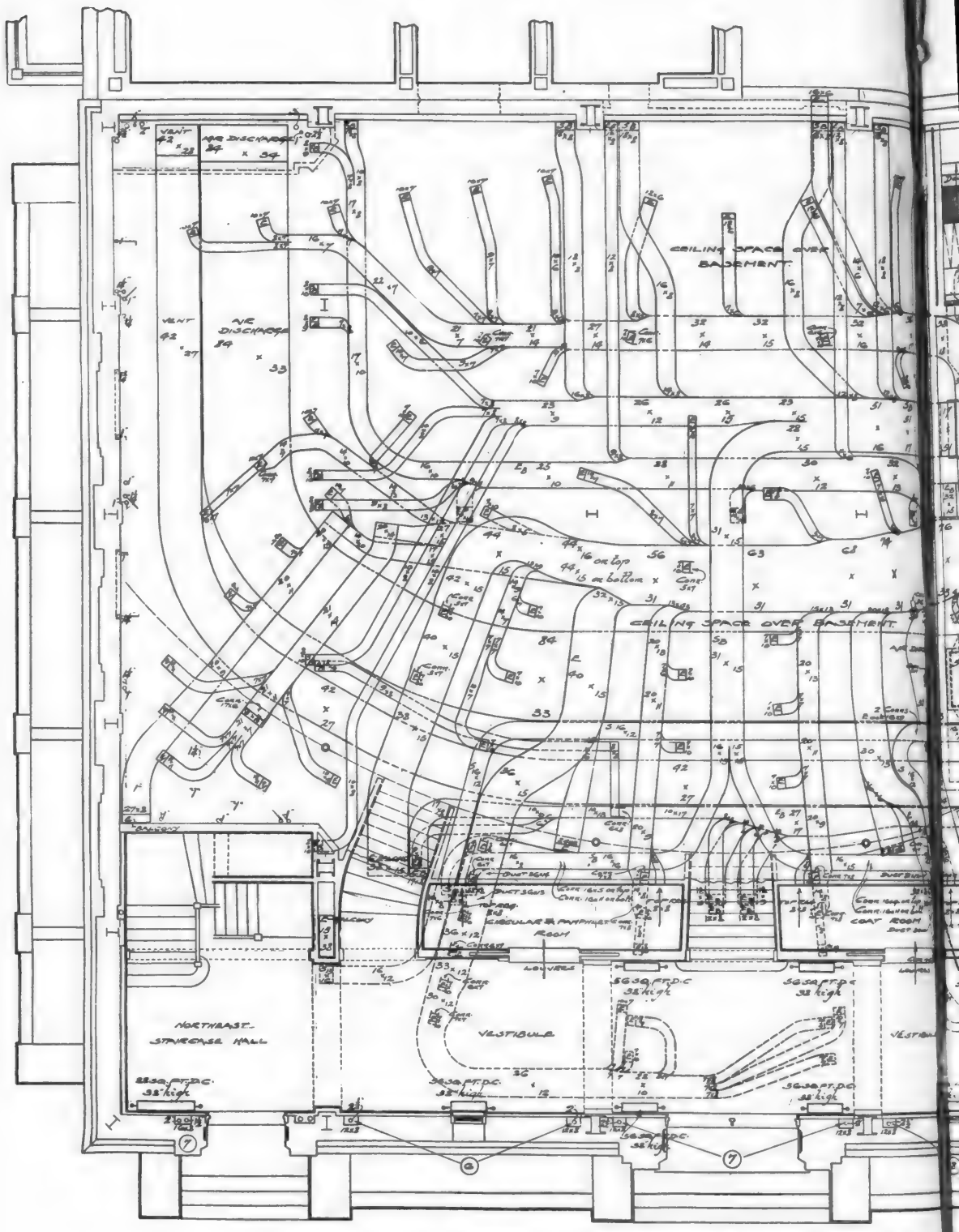
much more serious with higher velocities.

"With a velocity of 32 feet a second, it is 0.12 inches; with 64 feet a second, which is not getting up very high, it is 0.48 inches; with 128 feet a second, which is quite high, it is almost 2 inches—1.92 inches. That would be the minimum height of the condensation which would balance the velocity-head of the steam in the opposite direction.

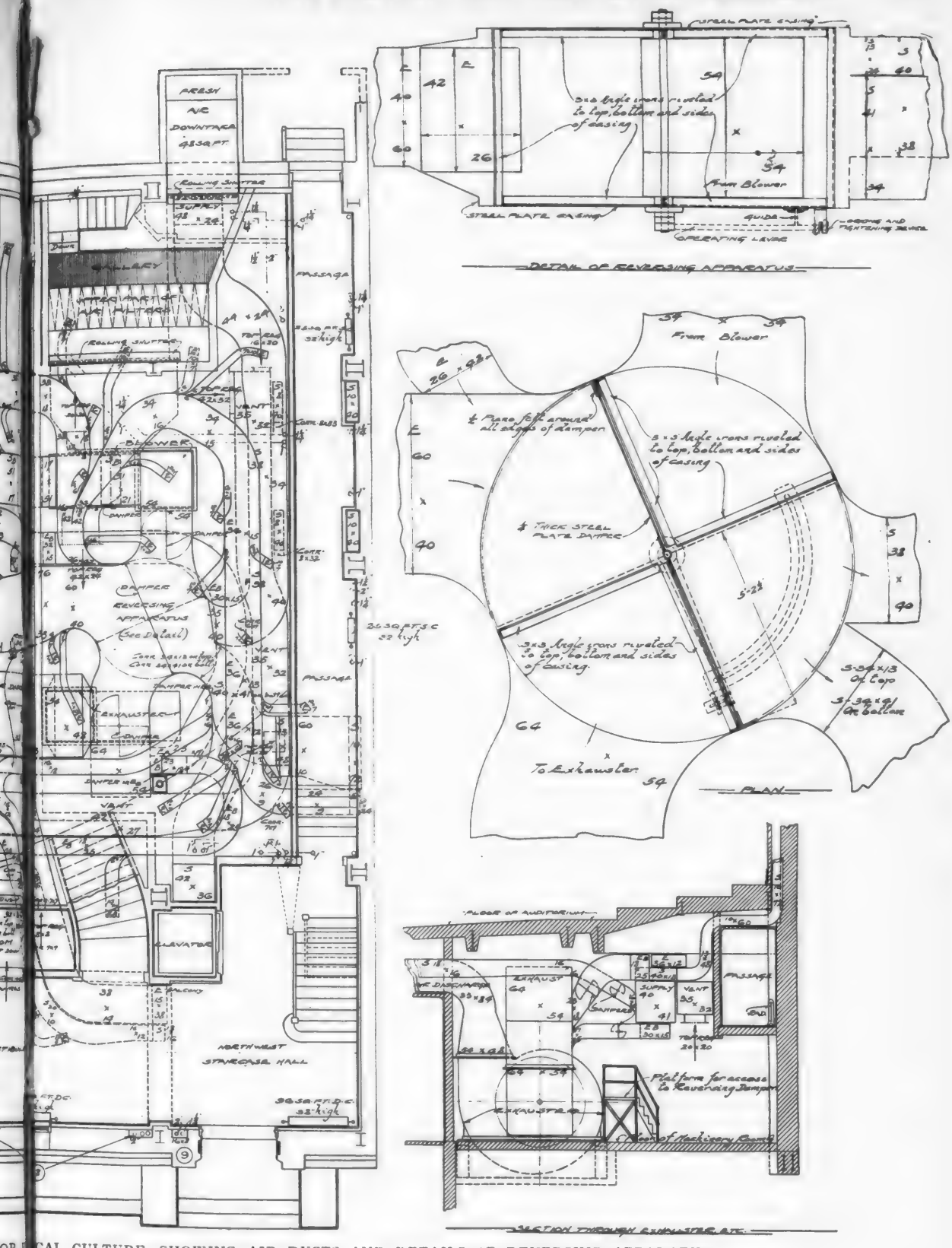
"To my mind, one of the most necessary things to know in connection with circulating steam is what these velocities should be for different-sized pipes, and to know the sort of drainage we are getting, to know when the condensation is being blown up the riser and to know when the condensation is really running back.

"I have visited plants where the specifications read that the water of condensation s h o u l d run back against the flow of steam where the water did not run back at all, but was carried in the opposite direction to some drip point."

The preliminary plans for the Panama-California Exposition, to be held in San Diego, Cal., in 1915, indicate that the exposition buildings will present a concrete idea of the whole art of Spanish Colonial architecture. The exposition management has retained Bertram G. Goodhue, of Boston, as architect, and has also secured the services of three of the foremost exposition builders in the country to create the "Mission City" that men have dreamed of for 300 years. Ground will be broken in July of this year for the first of these exposition buildings.



VESTIBULE PLAN, MEETING ROOM AND SUNDAY SCHOOL, SOCIETY FOR



OR PHYSICAL CULTURE, SHOWING AIR DUCTS AND DETAILS OF REVERSING APPARATUS

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THE past month has been marked by a noteworthy impetus to the cause of compulsory legislation. Indiana has swung into line with a satisfactory ventilation law relating to school houses. Kansas has just passed an equally satisfactory law embracing the ventilation of public buildings, including churches, moving picture show buildings and similar quarters. The New York legislature has now before it a factory and workroom ventilation bill which, it is said, has a good chance for passage and which is, under the circumstances, a fairly satisfactory measure. Finally, in New York City, Mayor Gaynor has just appointed a commission on moving picture shows, which, we are able to state, will devote particular attention to the sanitation of such places, with special reference to their proper ventilation.

IF unsettled trade conditions amount to anything in bringing together the affected interests, the forthcoming convention of master steam and hot water fitters in Chicago May 29-June 1 has an extraordinary opportunity to distinguish itself in the furtherance of the association idea. Chicago has been for some time in the grip of a bitter strike or, more properly, hold-up, in which the contending parties are the United Association of Plumbers and the International Association of Steam Fitters. In this quarrel, in which the employers have no part, the plumbers' association appears to be the aggressor in seeking to force the amalgamation of the steam fitters' with its own association. Violence has already marked the so-called strike and has led, moreover, to sympathetic strikes in other lines in an endeavor to sustain or break, as the case may be, the steamfitters' union. Several of Chicago's important buildings, now under construction, are tied up as a result of this peculiar labor war and, at this writing, the end is not yet in sight.

All who have had experience in association work will recognize at once the powerful argument afforded by such an object lesson for promoting closer relations among the employers. That the employers in Chicago have heeded the danger signal is noted in the increased membership of their local association. We believe that the display of wise statesmanship would pave the way for, if not actually bring about, the affiliation of the Chicago master fitters with the national association at this time. In any event, it is easy to surmise that the conditions described will lead to a distinctly forward movement on the part of the master fitters of Chicago and of the Middle West.

Central Station Heating

2—RATES

By Byron T. Gifford

(*This series of articles commenced in the April issue with a discussion of Pipe Line Losses.*)

It is this subject that affects the income of the heating plant, but the income is not directly proportional to the rate charged for the service, neither is it universally proportional to the rate. In fact, the rate we want is that which will give us the largest net earning per dollar invested, and at the same time serve the greatest number of people in a community, for we must not get away from the fact that a central station heating plant is a public utility, which means a public servant.

Up to the present time public utility commissions have not handed down any noted decisions relative to central station heating rates, but it is only a matter of time before this subject will be given careful consideration by the commissions and then, if not before, the subject of rates on heating will be standardized.

There are at this time two different methods used in charging for service,

(1) Meter basis.
(2) Flat rate basis.

The flat rate basis is subdivided again into two methods,

(1) Square foot of radiation basis.
(2) Cubic foot of contents basis.

There are, of course, advocates for each method. The writer knows of one large heating company which, after being on a meter basis, took out all meters and charged on a per square foot of radiation basis, because it claimed that it took too much time and money to watch the meters and adjust the bills each month. This trouble, it seems to the author, could have been obviated by careful installation and inspection of the meters. There will be without doubt many improvements in the steam meters, or rather in the method of using them. Also, a meter will be devised that will measure hot water heating service, but at present the flat rate is the only practical rate for hot water service.

It is not the intention of the author to advocate either method, as against the other, but rather to take for granted that both have come to stay, as is undoubtedly the case, and point out wherein the net results are affected by the rate to be charged in either case.

In any steam heating franchise granted in these days, the municipality will and should demand that the rate be stated plainly, and, in such a franchise, both meter and flat rates should be given, for the benefit of the company, as well as for the benefit of the city; for the company, because at some time it might be necessary to serve consumers on either basis or both bases, and for the city,

because it allows the consumer the choice of either system. The rates in this event should be equally equitable to both the consumer and the company.

Some consumers would rather pay more money per year, and know what they are to pay, than to be disappointed each month with a bill that they will invariably think is too high, and, on the other hand, there will be many consumers who will want the meter basis so that they can save money. Under any condition the consumer must be satisfied, and both methods are, therefore, advisable.

In a hot water heating franchise the meter rate is not necessary, because there are no meters on the market. When they do come, they will probably be the heat unit meter, and in that event 1,000,000 B.T.U. would be the logical basis of charge.

On a meter basis for steam heating, 1000 lbs. of steam is the basis of charge.

On a meter basis for hot water, 1,000,000 B.T.U. will probably be the basis of charge.

On a flat rate basis for hot water or steam heating the charge per annum or per season is either per square foot of radiation or per 1,000 cu. ft. of space heated.

When the charge per square foot of radiation is used as a basis it should be stated clearly that it is the radiation required to heat the building and not the radiation that is set in the building. The required radiation is the amount necessary to set so that the company can guarantee to maintain a comfortable temperature.

The rules for figuring these requirements should be plainly set out and should be rules that have been found reliable. The company should not be obliged to serve any building that is not equipped with at least the required amount of radiation. For if it did, it could not give satisfaction and that would be suicidal for the company and disagreeable to everyone concerned. The question has been asked many times, "Why do you require that I set a radiator in the guest's bed-room? We never use it and don't want it heated. We always have the door to this room closed," etc. It is, however, very easy to open the door and "take the chill off this room," and while doing it take the heat away from the rest of the house or take the heat away from the heating company without paying for it. One is as bad as the other. For that reason all rooms in the building should be equipped with the proper-sized radiators or, at least, the building should contain, in total, the required amount of radiation and the consumer should pay for the full requirements even though he does shut his bedroom radiator off at night, for in the morning, when he turns it on, he demands the capacity at the plant and in the mains to furnish that heat, and the company is reserving capacity in its mains and in its station to take care of him at all times. In other words, he demands a certain service that must be in reserve for him and for that reason he should not object to pay for it at a reasonable price.

With the flat rate per square foot basis, thermostatic control is almost essential to good operation and economical use of heat in the residences and buildings. With its use a more even distribution of heat is obtained over the entire heating system and an even temperature will be assured to all consumers. This device also saves the waste of heat and allows a lower rate to be charged for what is better service. There is, therefore, a twofold advantage in using thermostatic control, and it accrues to the interest of the consumer as well as to the company, on a flat rate basis.

The flat rate basis charge, of so much per thousand cubic feet of space, is not as equitable as the per square foot of radiation basis. For each and every 1000 cu. ft. of contents do not require the same amount of heat, owing to the difference in location and difference in use. For instance, 1000 cu. ft. in a corner drug store requires more heat at zero outside than does 1000 cu. ft. in a dentist's office at zero outside. This method is not used very much at the present time.

Meter rates should be based either on what it actually costs to give the service, plus a profit which is fair and equitable, or, if this information is not available, the rates can be based upon data from other towns of similar conditions, relative to outside temperature, price of fuel, cost of construction, etc. Under any condition, the company or the city, if a franchise is being granted, could afford to consult a central station heating engineer and get his report on the proposition.

Fifty cents per thousand pounds of steam condensed is approximately equal to fifty cents per 1,000,000 B.T.U., assuming 1 lb. of steam to liberate 1000 B.T.U., when condensing in a heating system.

The cost to the company to give heating service is made up of the following items, which should be figured on a basis of 1000 lbs. of steam generated or a multiple of that quantity.

Generating cost.	Taxes and insurance. Fuel. Water. Supplies. Repairs and renewals. Labor. Depreciation based on cost of generating station and machinery.
Distribution cost.	Taxes and insurance. Line loss in pounds of steam. Labor. Repairs and renewals. Depreciation based on cost of distributing system.
General, pro rated into above two.	Management, general expenses, and fixed charges.

In figuring on a new plant these costs should be figured for the conditions under consideration and a careful study of these conditions should be made.

The cost of hot water heat is computed the same way as for steam except the basis of figuring is per 1,000,000 B.T.U. generated.

The flat rate charged for steam or hot water per square foot of radiation per season is based upon the average number of heat units given off by the radiation, plus that given off by the pipe line, plus that given off by the piping in the buildings, which is approximately 5 per cent. in the first case, in a well constructed pipe line, and 5 per cent. in the second case, if the pipes are covered.

Take, for example, a city with an average temperature of 40° F. during the heating season. Average temperature of building= 70° F. Average temperature of circulating water in radiator (average wind), 140° (180° schedule); difference in temperature between room and radiator, 70° F. B.T.U. emitted per square foot per hour = $1.65 \times 70 = 115.5$ B.T.U. plus 10 per cent. $(5 + 5)$ for line and piping loss = 127 B.T.U. per hour.

A heating season from October 1 to May 15 is equal to 227 days or 5548 hrs. 5548 hrs. is the total number of hours in the average heating season, but there are about 350 hrs. during the average season that heat is not needed, and for that reason 5200 hrs. can be considered as the average heating hours in a season.

$5200 \times 127 = 660{,}400$ B.T.U. per season, including line and piping loss.

$5200 \times 121.2 = 630{,}300$ B.T.U. per season used in a building, provided each square foot of radiation is so set and figured as to emit an average of 121.2 B.T.U. per hour.

Now we can see that the cost of this service depends entirely, if on the flat rate basis, upon the number of B.T.U. emitted by the

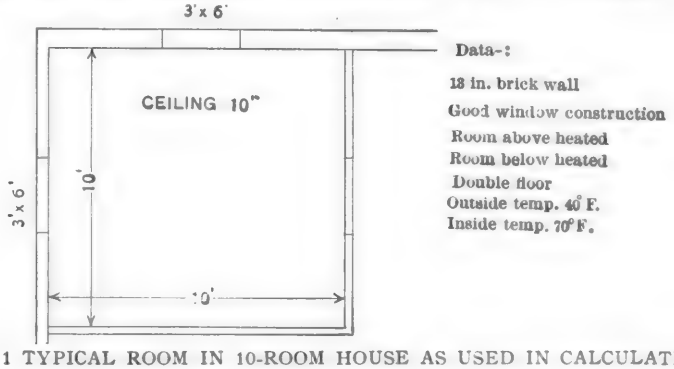


FIG. 1 TYPICAL ROOM IN 10-ROOM HOUSE AS USED IN CALCULATIONS

radiator per hour. There is another feature that enters into this calculation that materially affects the result. The amount of heat given off by the radiator is directly proportional to the amount needed to heat the room or building in which it is placed, provided, of course, that thermostatic control is used, for when the room is up to its required temperature the supply of heat will be shut off and the heat unit consumption reduced. To check this yearly B.T.U.

consumption, assume a 10-room house with each room the same as shown.

B.T.U. required per hour =

$$\text{Cubic contents} = \frac{10 \times 10 \times 10 \times 30}{50} = 600$$

$$\text{Glass surface} = 2\,(3 \times 6) \times 34 = 1224$$

$$\text{Exposed wall surface} = ((20 \times 10) - 36) \times 9 = 1476$$

3200 B.T.U.

Exposure 320

3520 B.T.U.

Radiation required for this room for —10° F. would be in C. S. hot water 60 sq. ft., and assuming 115.5 B.T.U. per square foot per hour we would have a B.T.U. consumption of 6900, which shows that about 50 per cent. of the time, at a temperature outside of 40° F., the radiator would be shut off, if thermostatic control is used.

5200 (hours) × 3520 B.T.U., 60 sq. ft. radiation = 304,720 B.T.U. per sq. ft. per season.

At the rate of 50c. per 1,000,000 B.T.U. the consumption would cost about 15.25c. plus 5 per cent. piping loss or about 16c. per square foot.

It should not be considered that thermostatic control will save 50 per cent. of the average heat consumption, for it will not, due to the fact that the consumer will shut off the radiators part of the time if the temperature of the building gets too high and, on the other hand, the occupants will demand fresh air, even with thermostatic control, and will open the window. About 30 per cent., the author believes, can be saved this way and, in addition, a more even and delightful service can be rendered to the consumer. In addition, therefore, to the above 16c. we must add about 40 per cent. or about 6c., which will bring our cost to the consumer up to 22c. per foot per season, if we assume the selling price to be equal to 50c. per 1,000,000 B.T.U., and this price has been assumed here only for comparison and not as any standard.

The Wisconsin Railroad Commission, in its reports, Vol. 2, page 302, states that, with coal at $2.00 per ton, exhaust steam could be sold at 50c. per 1000 pounds safely; that is, with a secure profit, but it also states that where live steam is sold there would be small profits unless large quantities of steam were sold.

The cost to the company should be analyzed and compiled carefully. This will be taken up in detail under "Operation and Management."

Whether on a flat rate or a meter rate, the amount of radiation set and the amount required are important for the management of a heating plant to know and a record of this data should be kept on file in the office of the company.

In making a rate for service per season it is desirable to know the percentage of heat used in any one month during the heating

season for two seasons: First, the collections are often made monthly; second, it sometimes happens that a credit or debit is given for certain months during the season, when the service is started or stopped in mid-season. The following table will be useful in this connection:

Heat Consumption Table

Heat used up to Oct. 31	6%
From Oct. 31 to Nov. 30	12%
From Nov. 30 to Dec. 31	18%
From Dec. 31 to January 31	21%
From Jan. 31 to Feb. 28	19%
From Feb. 28 to March 31	13%
From March 31 to April 30	8%
From April 30 to May 15	3%
	100%

The following division is used extensively in flat rate contracts and is easily remembered by the consumers.

5% of contract price payable October 1.
15% of contract price payable November 1.
20% of contract price payable December 1.
20% of contract price payable January 1.
20% of contract price payable February 1.
15% of contract price payable March 1.
5% of contract price payable April 1.

This gives the heating company its money partially in advance, but is no hardship to the consumer because, as a rule, if he operates his own furnace or boiler, he buys his coal in the summer and pays for it long before he uses it; therefore, paying on the above schedule allows him to pay his heating bill in several installments during the season.

It is often necessary to pro rate a heating bill, and for that the following table has been made from the above heat consumption table:

Table of Heat Consumption for Pro-Rating Heating Charges on Flat Rate

Assuming Oct. 1 as the start of the season.
Assuming May 25 as the close of the season.

For each day in October	6/31% = 0.194%
For each day in November	12/30% = 0. 40%
For each day in December	18/31% = 0. 58%
For each day in January	21/31% = 0.677%
For each day in February	19/28% = 0.678%
For each day in March	13/31% = 0.417%
For each day in April	8/30% = 0.267%
For each day in May	3/15% = 0. 20%

As an example, assume that a building requiring 1000 sq. ft. of steam radiation at 40c. per square foot per season was connected

November 21. What will the bill be for heating on the 30th of November and for the balance of the season? From the table, we find that 0.4% is the proportion of the annual charge for each day in November. For nine days in November the bill would be $9 \times 0.4 = 3.6\%$ of $\$400.00 = \$14.40$. For the balance of the season the bill would be 82% of $\$400.00 = \$328.00$ plus $\$14.40 = \$342.40$.

After a building is once connected for a season it is bad policy for the heating company to allow a consumer to discontinue the service for a short time with a full rebate, because of the fact that the company has invested its capital in the service lines and mains to serve this consumer and the company must also reserve capacity in its mains and station to serve this consumer, when he again wants the service. This is often asked of a heating company when a consumer is going away for a month or six weeks. If the consumer is on a meter basis this condition can be handled by means of a minimum charge, but on the flat rate basis the better and more equitable thing to do is to disconnect 50 per cent. of the radiation and charge full rate for the remaining 50 per cent. If the consumer is wise he will leave his house heated thoroughly while away, because of the fact that less damage will be done to the plumbing if the house is heated in cold weather and his furniture and woodwork will be better preserved in an even temperature.

Assume, now, that on February 17 the building above mentioned was to be closed up and approximately 50 per cent. of the radiation disconnected, leaving 560 sq. ft. connected. This condition continued until April 10, when the owner returned and all radiation was again connected. What credit should be allowed?

Answer:—

560 feet $\times$ 40 = \$224.00 per year.

From table:—

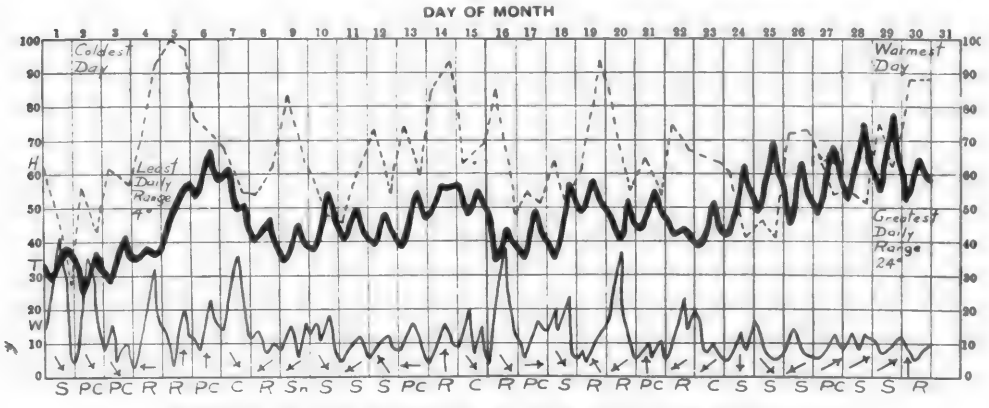
11 days in February	$= 11 \times 0.678\% =$	7.458%
31 days in March	$= 31 \times 0.417\% =$	13.000%
10 days in April	$= 10 \times 0.267\% =$	2.67 %
Percentage of season that the credit is allowed on		23.128%
23.128% of \$400.00		= \$92.51
23.128% of 224.00		= 51.80
		\$40.71

The author advises that never more than 50 per cent. of the radiation be disconnected and, whenever any radiation is disconnected, the heating guarantee should be discontinued by the heating company.

The "Ready to Serve" or "Maximum Demand" theory of charge in connection with the use of meters is a very equitable way of charging and is one that is rapidly coming into favor. This method will be discussed in the next paper, which will appear in the June issue.

The Weather for April, 1911

	New York	Boston	Pittsburg	Chicago	St. Louis
Highest temperature, degrees F.	78	80	78	70	74
Date of highest temperature	29	27	6	27	17
Lowest temperature, degrees F.	24	23	22	27	32
Date of lowest temperature	2	2	2	1	7
Greatest daily range, degrees F.	24	31	34	18	25
Date of greatest daily range	29	27	6	11	13
Least daily range, degrees F.	4	5	5	5	5
Date of least daily range	4	22	12	8	11
Mean temperature for month, degrees F.	48	46	48	46	54
Normal mean temp. this month, deg. F.	49	45.3	51	46.3	56
Total rainfall, inches	3.06	2.28	5.42	3.03	7.46
Total snowfall, inches	0.9	7.7	5.9	2.4	0.0
Normal precipitation, this month, inches	3.30	3.55	2.90	2.88	3.52
Total wind movement, miles	8120	8246	9202	9677	8030
Average hourly wind velocity, miles	11.3	11.5	12.8	13.4	10.2
Prevailing direction of wind	N. W.	West	N. W.	N. E.	S. E.
Number of clear days	10	11	7	10	10
Number of partly cloudy days	11	11	10	5	8
Number of cloudy days	8	8	13	15	12
Number of days on which rain fell	13	8	18	18	13
Number of days on which snow fell	1	3	4	1	0
Snow on ground at end of month, inches.	None	None	None	None	None


DAY OF MONTH
Coldest Day
Warmest Day
Least Daily Range 4°
Greatest Daily Range 24°
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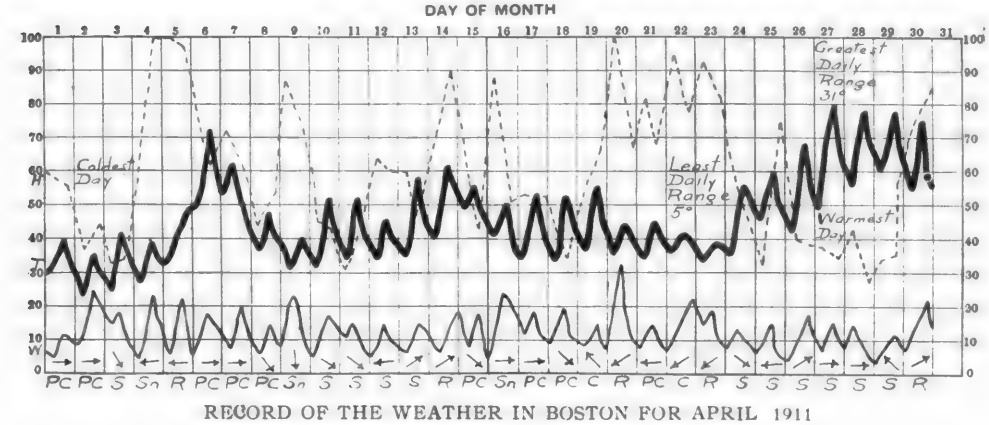
RECORD OF THE WEATHER IN NEW YORK FOR APRIL, 1911


DAY OF MONTH
Greatest Daily Range 31°
Coldest Day
Least Daily Range 5°
Warmest Day
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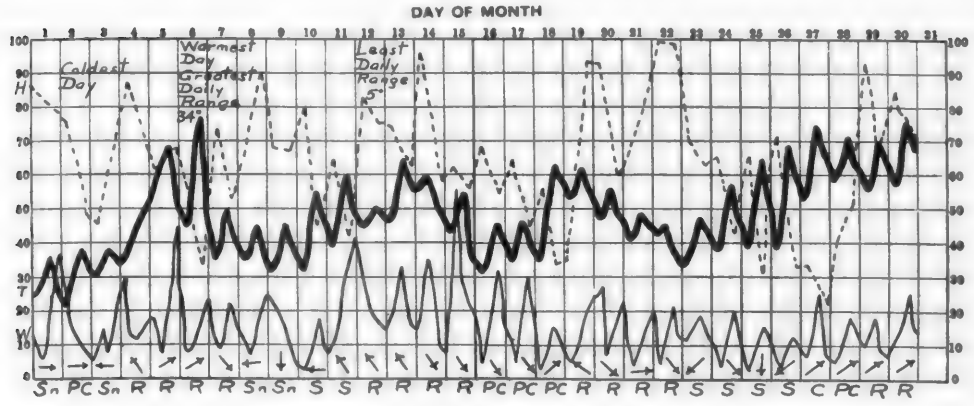
RECORD OF THE WEATHER IN BOSTON FOR APRIL 1911


DAY OF MONTH
Coldest Day
Warmest Day
Greatest Daily Range 34°
Least Daily Range 5°
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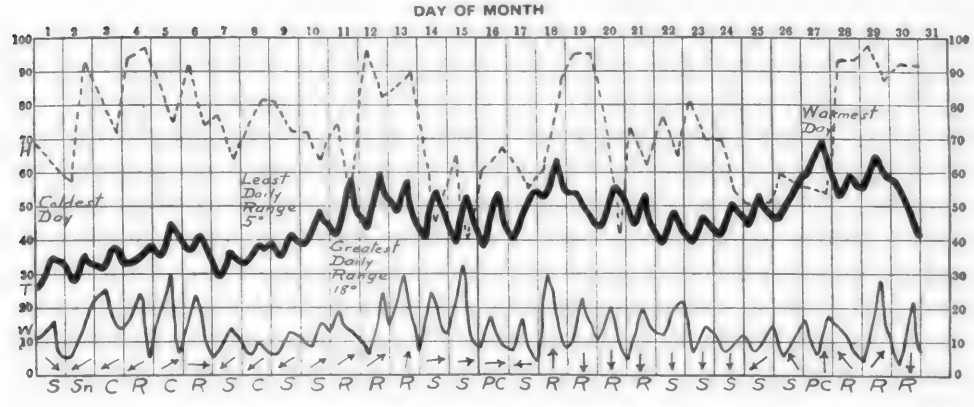
RECORD OF THE WEATHER IN PITTSBURG FOR APRIL, 1911


DAY OF MONTH
Coldest Day
Least Daily Range 5°
Greatest Daily Range 18°
Warmest Day
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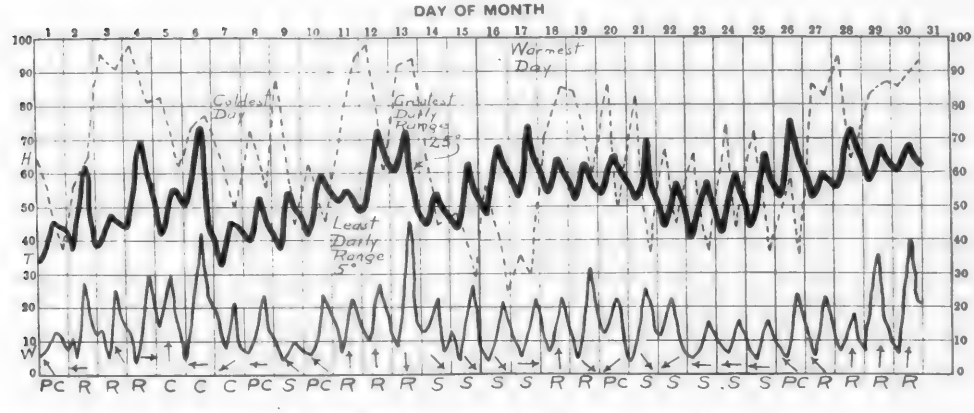
RECORD OF THE WEATHER IN CHICAGO FOR APRIL, 1911


DAY OF MONTH
Warmest Day
Coldest Day
Greatest Daily Range 12.4°
Least Daily Range 5°
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Pc R R R C C C Pc S Pc R R R S S S S R R Pc S S S S S Pc R R R R

RECORD OF THE WEATHER IN ST. LOUIS FOR APRIL 1911

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A.M. and 8 P.M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—Snow.
Arrows fly with prevailing direction of wind.

New Ventilation Law in Kansas

Kansas has joined the growing ranks of the compulsory ventilation law States, by passing a measure requiring the proper ventilation of theatres, picture shows and other public buildings, including churches.

The new law is called a "Fire-Escape Inspection and Theatre Ventilation Law," and is to be found in Chapter 197, Laws of 1911, entitled "An Act to provide for better protection of the health and safety of people who assemble in public halls, public houses of entertainment, theatres and places of amusement, tenement houses, apartment houses, rooming houses and other places, and regulating the same and providing penalties for the violation thereof, and repealing Chapter 149, Session Laws of 1909." The law was approved March 14, 1911, and published March 27, 1911.

That part relating to ventilation is contained in the following sections:

VENTILATION OF THEATRES AND PICTURE SHOWS

Sec. 4. It shall be unlawful for the owner, proprietors or lessee to operate any theatre, picture show or place of amusement in any structure, room or place in the State of Kansas which structure, room or place is capable of containing fifty or more persons unless the system of ventilation is capable of supplying at least 30 cu. ft. of fresh air per minute for each person therein.

VENTILATOR FANS—BOOTHS FOR PICTURE MACHINES—ELECTRIC WIRING

Sec. 5. All such structures, rooms or places used for the purpose mentioned in section 4 of this act having less than 500 cu. ft. of air space for each person, and all rooms having less than 2000 cu. ft. of air space for each person in which the outside window and door area used for ventilation is less than one-eighth of the floor area, shall be provided with a draught fan or other artificial means of ventilation installed so as to force the stagnant air outward from said structure, room or place. In the end of the room opposite said fan an inlet ventilator shall be provided of sufficient size to admit the required amount of fresh air as provided in section 4 of this act. All booths used for moving picture machines shall be made of galvanized sheet iron of not less than 20 B. W. gage, or ¼-in. hard asbestos board, securely riveted or bolted to angle iron frame (of not less than 1x1x¼ in. angle iron, properly braced), or equivalent fire resisting material. A not less than 6-in. diameter ventilating pipe shall be used as an exhaust for the hot air generated in operating the machine. All electric wiring shall be in accordance with the National Electrical Code.

Inspection is to be made at least once every six months, and failure to comply with the law makes the proprietor, lessee or manager subject to a fine of $10.00 per day for such failure.

State Superintendent of Building Inspection W. L. A. Johnson is sending out copies of the new law, which provides that 30 cu. ft. of fresh air per minute must be furnished for each person in the building. Accompanying the law is a set of rules devised by the State Superintendent to assist those concerned in fulfilling the requirements of the law. The rules are as follows:

"1. With natural ventilation by doors and windows, under normal conditions and at normal temperature, the velocity of air travel is estimated to be from 30 to 60 ft. per minute, where the exhaust equals the intake in area.

"2. With natural ventilation by ventilating flues and chimneys under normal conditions, the velocity of air travel is estimated at 200 to 300 ft. per minute. The velocity of air travel through ventilators in ceilings will range about 100 to 150 ft. per minute.

"3. Small power fans, placed in windows or openings in walls, will give a force velocity of air travel from 800 to 900 ft. per minute, where the fans compare reasonably well with the size of the openings.

"4. The velocity in number of feet of air travel per minute multiplied by the number of square feet of area of openings used for ventilation will give the volume of air in cubic feet that will pass through the opening per minute.

"5. To determine the required amount of artificial ventilation, multiply the number of seating capacity by thirty and from this amount subtract the number of cubic feet of air obtained per minute from natural ventilation as per rules 1 and 2. The remainder will be the amount of air in cubic feet to be supplied by fans or otherwise."

One of the things cautioned against in ventilating is the "short circuiting" of air.

"Baffle" boards for the breakage of drafts also are demanded by the law.

For correct ventilation, the inlet openings should be near the top of the room and the outlet near the bottom, and in the opposite end of the room. No intake should be placed less than 8 ft. about the floor. Where fans are used, it is recommended that they should all be placed in the outlet, so as to draw the foul air from the room.

The placing of chairs or stools in aisles also is to be tabooed under the new law.

A semi-annual report is required of the fire chief, whose duty it is to inspect the buildings to compel whatever change he may desire made.

Indiana Passes Ventilation Law

A satisfactory ventilation law has been passed in Indiana and was approved March 3, 1911, covering the ventilation of school houses. The law is entitled "An Act to protect the health and lives of school children and increase their efficiency by providing healthful school houses and requiring the teaching of hygiene." The subjects covered include sites, lighting, blackboards and cloakrooms, water supply and drinking arrangements, heating and ventilating, water closets and outhouses. The section on heating and ventilating is as follows:

"Ventilating heating stoves, furnaces and heaters of all kinds shall be capable of maintaining a temperature of 70° F. in zero weather and of maintaining a relative humidity of at least 40%; and said heaters of all kinds shall take air from outside the building and, after heating, introduce it into the schoolroom at a point not less than 5 nor more than 7 ft. from the floor, at a minimum rate of 30 cu. ft. per minute per pupil, regardless of outside atmospheric conditions; provided, that when direct-indirect steam heating is adopted this provision as to height of entrance of hot air shall not apply. Halls, office rooms, laboratories and manual training rooms may have direct steam radiators, but direct steam heating is forbidden for study schoolrooms, and direct-indirect steam heating is permitted.

"All schoolrooms shall be provided with ventilating ducts of ample size to withdraw the air at least four times every hour, and said ducts and their openings shall be on the same side of the room with the hot-air ducts."

New Factory Ventilation Bill in New York State

A new bill has been introduced in the New York State Assembly by Mr. Boylan, to regulate the ventilation of factories and workrooms in the State of New York. It is No. 1480. This is a measure for which a committee of the American Society of Heating and Ventilating Engineers (D. D. Kimball, chairman) has been working on for over a year. While the committee reports that the proposed legislation is not everything that it could wish for, it is believed to be the best possible at this time, all things considered, and the bill is reported to have a good chance of passage, as it has the approval of a considerable number of associations, including those of realty interests.

The bill provides that a workroom must be ventilated so that the air within does not contain more than nine parts of carbon dioxide in 10,000 volumes of the air in excess of the number of parts of carbon dioxide in 10,000 volumes of the outside air, or so that there is constantly supplied throughout the interior of the room at least 1200 cu. ft. of air per hour per person, and, in addition, 1000 cu. ft. of air for each cubic foot of gas burned per hour, the air to be taken from an uncontaminated source. The temperature must never be less than 55° F., and, except in boiler-rooms, never more than 72° F. wet-bulb temperature, unless the wet-bulb temperature outside exceeds 70°, when the wet-bulb temperature inside must not exceed the wet-bulb temperature outside by more than 5°.

The means for ventilation must be provided for by the owner unless a written agreement can be shown that the occupier is to furnish the means. The occupier must maintain the ventilation. Failure to provide the means of ventilation within 30 days of notice is penalized by a forfeit of $10 per day, and an occupier who fails to maintain ventilation is guilty of a misdemeanor. Local ventilation is required for special manufacturing processes where dust, fumes, gases and the like are given off. The Commissioner of Labor, under whose jurisdiction the operation of factories comes, is required to have an experienced engineer in the bureau of factory inspection to approve or disapprove plans for ventilation.

Federal Furnace League

Federal Furnace League, at its fourth annual meeting, held in New York, May 9, elected the following officers for the ensuing year:

President, Charles S. Prizer, Philadelphia; vice-president, A. W. Glessner, Chicago; executive committee: William J. Myers, New York; William C. J. Doolittle, Utica, N. Y.; Lewis Moore, Utica, N. Y.; George A. Munson, Connellsville, Pa., and Robert S. Wood, Troy, N. Y.

Mr. Prizer declined reëlection as president and the matter was left in the hands of the executive committee.

Among the subjects discussed were the following: "The Official Federal Furnace League Method of Testing Furnaces," by Dr. William F. Colbert, engineer and lecturer of the league; "Furnace Heating as the Only Practical Method of Indirect Heating" by George F. Langenburg, St. Louis.

A paper was also presented by W. W. Macon, secretary of The American Society of Heating and Ventilating Engineers.

American Radiator Co., Chicago, Ill., has sold its Bundy trap business to the Nashua Machine Co., Nashua, N. H., the new arrangement becoming effective May 1.

National District Heating Association

Arrangements are practically complete for the third annual convention of the National District Heating Association, which will be held at the Fort Pitt Hotel, Pittsburg, Tuesday, Wednesday and Thursday, June 6-8, 1911. The professional programme is substantially as follows:

TUESDAY AFTERNOON, JUNE 6

President's Address.

Report of Committee on Data. E. J. Kiefer, Easton, Pa., chairman.

WEDNESDAY MORNING, JUNE 7

Paper: "Investigation on the Transmission of Heat through Radiating Surfaces," by John R. Allen, Professor of Mechanical Engineering, Michigan University, Ann Arbor, Mich.

Paper: "Heating Franchises," by A. C. Gillham, Chicago, Ill.

Paper: "Result of Measuring Station Load by Venturi and General Electric Meters," by F. C. Chambers, Springfield, Ill.

THURSDAY MORNING, JUNE 8

Consideration and vote on new constitution.

Election of officers.

Paper: "The Heating and Ventilating Equipment of the City Investing Building of New York City," by J. Byers Holbrook, M.E., New York.

Report of the Committee on Meters.

Paper: "Superheated Steam," by W. E. Dowd, Philadelphia, Pa.

THURSDAY AFTERNOON, JUNE 8

Paper: "Handling Customers," by Geo. W. Wright, Baltimore. Md.

Report of Committee on Radiation.

Paper: "The Preparation of a Rational Rate System," by R. D. DeWolf, Rochester, N. Y.

Paper: "Best System of Radiation for Economy and Steam Consumption When Fed from a District Heating Station," by Walter J. Kline, Rockport, N. Y.

Same, as applied to hot water, by A. C. Rogers, Toledo, O.

Among the entertainment features will be an inspection trip to the works of the Westinghouse Electric & Manufacturing Co. in East Pittsburg.

Tuesday evening, June 6, the association will entertain all in attendance at a theater party at one of the theaters of Pittsburg. Announcement of this particular event will be made later.

On Wednesday afternoon, June 7, on the special invitation of the Westinghouse Electric and Manufacturing Company, Pittsburg, all attending will be taken as their guests to the great works of the Westinghouse Company, at East Pittsburg. The management of the Westinghouse Company is noted for its hospitality, and the afternoon can be looked forward to as one of the pleasures of the convention.

The entertainment committee for the convention is composed entirely of Pittsburg men, as follows:

Geo. W. Folds, Manager, H. W. Johns-Manville Co.
R. S. Orr, General Superintendent, Allegheny County Light Co.
J. M. Graves, Superintendent, Power, Allegheny County Light Co.
W. A. Donkin, Superintendent, Contract Department, Allegheny County Light Co.
C. P. Hill, President, Doubleday Hill Electric Co.
W. D. Shaler, Secretary, Doubleday Hill Electric Co.
Cadwallader Evans, Jr., Superintendent, Oliver Power and Heating Co.
John Hyde, Superintendent, Phipps Power Building.
H. C. Glass, Industrial and Power Department, Westinghouse Co.
J. C. McQuiston, Manager, Bureau of Publicity, Westinghouse Co.
J. O. Little, Assistant Manager, Bureau of Publicity, Westinghouse Co.
W. B. Wilkinson, Sales Department, Westinghouse Co.
J. D. Hiles, General Sales Manager, Best Manufacturing Co.
G. W. Provost, President, Union Electric Co.
John Klingelhofer, American Foundry and Construction Co.
E. B. Tyler, Pittsburg, Pa.
Ray Goss, Manager, Robbins Electric Co.

The convention will open with the address of Mr. Geo. W. Wright, of Baltimore, Md., president of the association. Following this will be addresses by the mayor of Pittsburg, and the president of the Chamber of Commerce, welcoming the delegates to Pittsburg.

The report of the Committee on Data, which will be given by E. J. Keifer, will prove exceedingly interesting to all who are concerned in the cost of heating, as particular attention has been paid by the committee, in collecting the data, in reference to cost.

The University of Michigan, through its engineering department, has for some three years past been experimenting on the transmission of heat through different radiating surfaces and also the transmission of heat as affected by the coloring and painting of radiators, and the association is promised some interesting results of these experiments, which should result in a large saving to the central station as well as a saving to the user of radiators where he is furnishing his own fuel.

Franchises in the heating business are not difficult to procure, but central station men have found more trouble resulting from failure to include all things that should be included in such franchises, and this will be particularly considered by A. C. Gillham, of the Central Station Engineering Co., Chicago.

Users of meters are always inclined to look with suspicion upon the claims made by manufacturers of a particular meter, and an account of their reports and results where tabulated and obtained from actual use by central station men

that are not interested in the manufacture is always carefully considered and given much weight. The paper on this subject, which will describe the results which have been obtained from the use of two standard types of meters, will be presented by F. C. Chambers, of the Springfield Light, Heat and Power Company, Springfield, Ill.

The paper by J. Byers Holbrook, M.E., New York, will be a description of one of the latest installations of a great heating system—the plant installed in the City Investing Building, New York. This paper will prove of value to all interested in the installation of heating apparatus, whether of central station or isolated nature.

The subject of superheated steam is one which has been discussed pro and con by many central station men, and the paper of **W. E. Dowd, Jr., manager** of the Power Specialty Co., Philadelphia, promises some new development in that direction.

The paper by the president of the association, on the subject of handling customers, will prove of great value to the central station men, for probably in no other line of central station work has the subject of handling customers more weight than in central station heating work, as the question of comfort enters into the business greater than in any other line of plant operation.

A paper which is being looked forward to by central station heating men all over the country is on "The Preparation of a Rational Rate System," by R. D. DeWolf, of the Rochester Railway and Light Co., Rochester, N. Y. Heat is being sold all over this country in all kinds of manner, and the qualifications of Mr. DeWolf insure a paper upon this subject that will prove of great value.

At the request of a number of the members of the association, papers were solicited on the subject of the best systems of radiation and the best manner of installation of radiation system for connecting up to the central station mains. Considerable difficulty has been experienced by every central station man in connecting up systems of radiation which have been installed for isolated plants, and it is thought by the consideration of this subject to encourage the installation of such systems that will be easily adapted to and give the best results to central station mains. This will be considered from both the steam and hot water standpoint, the steam being treated in a paper by Walter J. Kline, of the American District Steam Co., of Lockport, N. Y., and for hot water by A. C. Rogers, manager of the heating department of the Toledo Railway and Light Co., Toledo, Ohio.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Advantages of Society's New Home

In a recently-issued circular, the advantages to the American Society of Heating and Ventilating Engineers, through its new location in the Engineering Societies Building, New York, are detailed at length. This body, it is pointed out, is now one of the associated engineering societies. By virtue of this connection, members of the society are privileged to consult the library at any time, as well as to use a writing and reception room adjoining the entrance hall. A reception and retiring room is also provided for the ladies. The society's own quarters are adapted for committee and other meetings relating to its work.

The circular contains illustrations from photographs of the principal rooms in the Engineering Societies Building, and concludes with a concise account of the society's activities and advantages of membership.

Illinois Chapter

The April meeting of the Illinois Chapter of the society was the occasion of a tribute of friendship and respect to John F. Hale, retiring secretary of the chapter, whose headquarters for the future will be in Camden, N. J., with Warren Webster & Co. Mr. Hale was presented with a silver water pitcher and following the more formal presentation he was made the recipient of the good wishes of the entire company. Samuel R. Lewis burst into poetry with a notable contribution, entitled "To John Hale." The office of secretary of the Illinois Chapter was filled by the election of Charles F. Newport.

An illustrated lecture was given during the evening by E. F. Capron on the "Panama Canal," detailing his recent trip to the Isthmus.

The resignation was announced of George D. Mehring from the local Ventilation Committee. August Kehm, the chapter's treasurer, announced that he had no report to make, as he was going to Europe, a statement that unintentionally evoked much hilarity.

"A Study of the Ventilation of Sleeping Cars" is the title of a paper by Thomas F. Crowder, M.D., read before the American Public Health Association, at its meeting in Milwaukee, in September, 1910. The paper is being reprinted for free distribution in pamphlet form by the Pullman Co., Chicago, Department of Sanitation, of which Mr. Crowder is superintendent.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Pennsylvania State Association

The annual convention of the Pennsylvania State Association of Master Steam and Hot Water Fitters will be held in Pittsburg, Pa., May 27, with headquarters at the Fort Pitt Hotel, Penn avenue and 10th street. Following the convention it is planned to proceed in a body to the convention of the National Association in Chicago, which opens on the following Monday. The State Association is sending out a circular letter to its members asking for detailed lists of kits of tools entrusted to steamfitters and for information relating to the forms used by workmen reporting their time and material, both for contract work and jobbing work. The association is endeavoring to secure a greater uniformity in these respects and in similar details of shop management and the replies received will provide discussion not only at the State convention, but at the National convention.

Steam Heating and Ventilating Engineers of Chicago

At the second annual meeting of the Steam Heating and Ventilating Engigineers of Chicago, the following officers were elected: President, W. B. Graves; vice-president, John O'Shea; treasurer, William Sullivan; secretary, George H. Kirk; directors, Robert Gordon, Charles Glennon and G. F. Schample.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CHURCHES

The Heating and Ventilation of Churches. Charles L. Hubbard. First of a series of articles prepared with special reference to the needs of the architect. Aims to give simple rules and directions for the selection of the heating and ventilating system, so that it may be incorporated in the plans. 3500 words. Br Build. Feb., 1911. 60c.

CHARTS FOR SOLVING FORMULAS

A Chart for the Calculation of Engineering Formulæ. M. E. J. Gheury. Describes principal charts for three or more variables involving curves, which may be constructed with great rapidity. 4,200 words. Engr. Feb. 24, 1911. 40c.

ECONOMIZERS

Notes on the Working of Economizers. 2000 words. Prac Engr. Mar. 17, 1911. 40c.

FAN BLAST HEATING

Design of Fan Blast Heating. H. C. Russell. Gives basic data covering the proportioning of heating apparatus for factories, schools and public buildings. 1800 words. Met. Wkr. Feb. 25, 1911. 20c.

Fan Drives and Pipe Sizes in Blast Heating. H. C. Russell. Gives hints on means of propelling blowers; formulas for steam and return pipes, etc. Discusses methods of humidifying air. 1200 words. Met. Wkr. Mar. 25, 1911. 20c.

FEED WATER HEATING

Details of Power Plant Design. Charles L. Hubbard. Deals with boiler feeding and condenser equipment. 2600 words. Prac. Engr. Mar., 1911. 20c.

ISOLATED PLANTS

Central Station vs. Factory Plant. Henry D. Jackson. Gives two instances where cost of operation of isolated plants was less than the cost of Central Station service. 1500 words. Power. Feb. 14, 1911. 20c.

PIPING

Power Plant Piping. W. H. Wakeman. Describes various forms of supports for main steam pipes. 1300 words. Steam. Mar., 1911. LX. 20c.

POWER PLANTS

The New York Central Power Plant at West Albany. Illustrated description of the plant for furnishing light, heat, and power to the large repair shops, which has recently been enlarged. 2500 words. Eng. Rec. Feb. 18, 1911. 20c.

Congressional Power Plant at Washington. M. C. Turpin. Illustrated description of a central generating station for supplying a group of buildings on Capitol Hill with electricity and steam. 6000 words. Elec. Wld. Feb. 9, 1911. 20c.

TEMPERATURE REGULATION

Automatic Regulation of Temperature. Describes system in which the regulation of the temperature of rooms is automatically effected by means of a thermostat connected to a supply of compressed air at a pressure of 10 lbs. per sq. in., which is caused to act upon a simple diaphragm valve on the steam pipe to the radiators. 900 words. Engr. Mar. 3, 1911. 40c.

VENTILATION

Winter Uses for Electric Fans. Albert Scheible. Suggests their use to prevent air stagnation in rooms, diffusing the heat, restoring humidity, etc. 1500 words.

A New Vacuum Cleaning Plant for Residences

Almost everyone is now ready to admit the superiority of vacuum cleaning over any other system for the removal of dust, dirt and disease germs from carpets, upholsteries, tapestries, etc. As vacuum cleaning in the household has become more popular, and its advantages better understood, there has been an increasing demand for some kind of a stationary vacuum cleaning unit to take the place of the portable machine.

This demand is felt more keenly in the medium and large-size residences, where it is something of a job to lug around the ordinary types of portable cleaner. Therefore, the central vacuum cleaning system has been developed, in which the pump and a motor to drive it are located in the basement and the house is piped in a manner similar to the ordinary steam piping, and outlets are provided on different floors at convenient places for attaching the length of hose and the cleaning tool. The advantage of this system is that all of the dust collecting apparatus can be located in the basement in an out-of-the-way place; there is no danger of the dirt getting out of the dust receptacle and back into the room, and it is entirely unnecessary to handle the dirt after it has once been collected.

However, most of these central vacuum cleaning systems have merely been large-size, portable machines located in the basement. The United Vacuum Appliance Company, New York and Connersville, Ind., has recently brought out a different system in which the vacuum producing part consists of a rotary blower of the Connersville type. This type of blower has been in use for many years for pumping gases and for removing the air from condensers, etc.

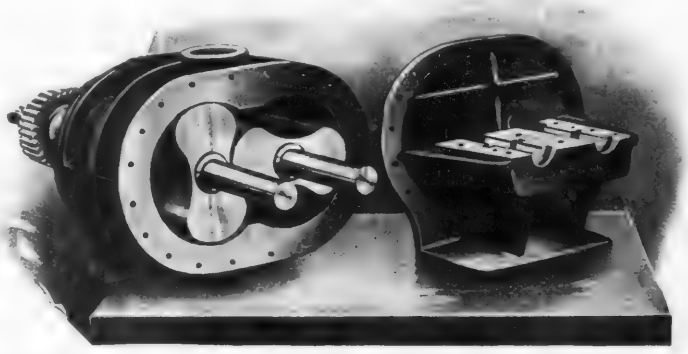


FIG. 2—CONNERSVILLE ROTARY PUMP WITH END COVER REMOVED

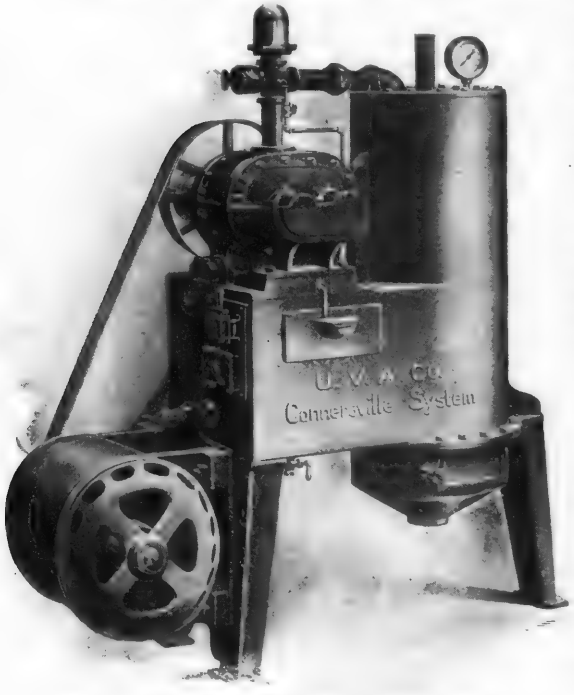


FIG. 1—HOUSE VACUUM CLEANING UNIT

As will be noted from Fig. 1, the Connersville residential outfit consists of a motor, a vacuum pump and a separator tank, all compactly grouped on one base. The air and dirt from the piping system enters the top of the tank, pass through a pipe which is immersed in water, allowing the air to filter through, but catching all the dirt and holding it in suspension. The dirty water is discharged automatically into the sewer immediately after stopping the motor, leaving the separator empty and ready for the next cleaning. When the motor is started again, the separator tank receives its supply of water automatically, requiring for each filling about six or eight gallons. By the use of this device the pump receives only clean air, which overcomes the wear and tear due to foreign matter passing through it. The exhaust air is then carried to the chimney or other vent. If desired, the sewer and water connection can be dispensed with, substituting for them a canvas screen separator and catching the dirt in a galvanized iron receiver, which is emptied by the operator.

The pump used in this unit is shown with end cover removed, in Fig. 2, from which it will be seen that it consists only

of a shell and two revolving impellers. There are no valves to become clogged. The bearings are made extra large and provided with oil wells and ring oilers so that the only attention that the pump needs is an occasional replenishing of the oil reservoirs.

The motor is mounted vertically on a hinged frame so that the belt can be tightened or loosened by the set screw. The starting mechanism is grouped on the vacuum cleaning unit so that there is practically no wiring expense incurred in installing this unit. The Connersville pump has been found to be noiseless in operation.

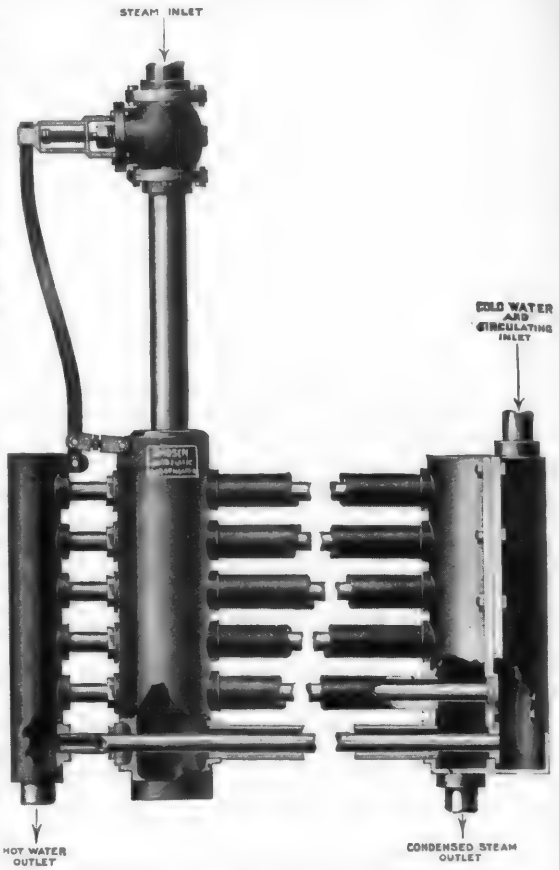
Buffalo Strainers

For removing foreign matter from feed water, water supply and similar systems, a strainer that differs in many ways from the usual type has recently been placed on the market. The development of strainers has been along the line of automatic and semi-automatic types, involving more or less complicated design. The feature of this new strainer is in the opposite direction. It consists of only four parts,—the body, basket, top and clamp. To clean the strainer it is necessary simply to loosen and remove clamp and cover, take out basket and clean under a faucet.

The vital part of every strainer, the basket, is of fine mesh brass screen, soldered to a brass "former" or top piece, and stiffened both horizontally and vertically by brass strips and bands. It is made unusually large to decrease the resistance offered to the flow of water, the minimum area allowed being fifteen times that of the connecting pipe. This also increases the effectiveness of the strainer and lengthens the time in service before cleaning becomes necessary. If continuous operation is necessary, a by-pass, with or without a second strainer, can be installed.

The service given for many years by these strainers in connection with air washing apparatus made by the Buffalo Forge Co., Buffalo, N. Y., has induced this company to place the strainer on the market for general service. A new booklet, No. 114, describes this strainer in detail.

BUFFALO WATER STRAINER



SIX-PIPE MADSEN WATER HEATER, WITH A CAPACITY OF 1,080 GALS. OF WATER PER HOUR FROM 36° TO 150° F., USING STEAM AT 5 LBS. GAGE

Madsen Automatic Water Heater

A continuous supply of hot water at the desired temperature, the elimination of storage tanks, positive and automatic action, cleanliness, economy, no floor space required and provision for increase of capacity are among the more important features noted in the construction of the Madsen Automatic Water Heater, made by the Spacesaving Appliance Co., 135-141 West 20th street, New York. This interesting heater consists of a group of concentric iron and brass pipes, water passing through the inner pipes and steam through the outer. The steam and water do not come in contact, a feature designed to keep the water pure.

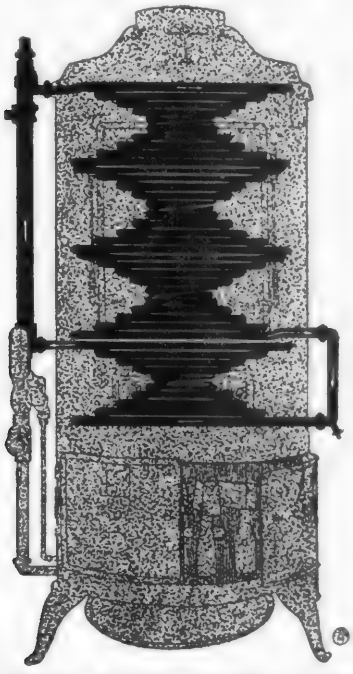
To maintain the hot water at a fixed temperature, with a variable demand, steam is admitted to the heater through an automatic valve, which can be set to give water of any desired temperature. The steam valve is operated by a lever, controlled by the

inner brass pipes, which contract and expand as the water is drawn from the heater.

The heater is made in five sizes for low pressure steam using ¾-in. brass pipe and has a capacity of supplying from 85 gals. of water per hour at atmospheric pressure to 1176 gals. per hour at 4-lbs. pressure. For high pressure, it is made with both ½-in. and ¾-in. brass pipes, with a capacity from 120 gals. of water per hour at 5-lbs. pressure to 6000 gals. per hour at 75-lbs. pressure.

Overcoming Lime Deposits in Water Heaters

This fault has been successfully overcome in the type known as the Pittsburg heaters, manufactured by the Pittsburg Water Heater Co., Pittsburg, Pa. The



PITTSBURG WATER HEATER EQUIPPED WITH CIRCULATING THERMOSTAT

circulating thermostat causes a continual circulation of water through the extra large coils, preventing overheating and eliminating all chance of deposits forming and at the same time keeping the water at uniform heat. Accurate regulation and control of the heat of the water prevents precipitation, as hard water will not precipitate except when heated to 150° F. or over. The thermostat is set to shut off the gas at 140° F.

Vacuum Heating System (Air Exhauster) is the title of a circular published by Frederick Leonhard, Cleveland, O., illustrating and describing the Leonhard automatic water-driven air exhauster for use in connection with vacuum steam heating systems.

Economical Power Plant Operation is the subject of an interesting treatise published by the Department of Testing and Inspection of the Richard D. Kimball Co., engineers, Boston and New York. The book is designed to show heating, lighting and power plant owners, managers and superintendents, the various ways in which wastes occur in the operation of such plants and outlines a method of testing and regular inspection to obtain the most economical and efficient operation. Pp. 24. Size 5½x8½ in.

Advertisers' Index

Alberger Condenser Co. 3
American District Steam Co..... 58
American Radiator Co.....Back cover
Applied Heating and Ventilation..... 65
Armstrong Mfg. Co..... 55
Books on Heating and Ventilation.. 63
Carrier Air Conditioning Co..... 3
Chapman, R. W..... 56
Connersville Blower Co..... 59
Crosby Steam Gage & Valve Co., Front cover
Dixon Crucible Co., Joseph..... 58
Exeter Machine Works..... 14
Ford Co., Thomas P.....Front cover
Foster Engineering Co..... 12
Garden City Fan Co..... 64
Garwood Electric Co. 64
Globe Ventilator Co.....Front cover
Green Fuel Economizer..... 4
Gurney Heater Mfg. Co.....Front cover
Harrison Safety Boiler Works..... 5
Jenkins Bros. 57
Johns-Manville Co., H. W..... 64
Kauffman Heating & Engineering Co. 10
Keasbey Co., Robert A..... 55
Knowles, Geo. E.....Front cover
Lavigne Mfg. Co..... 7
McGonagle, Arthur 62
Massachusetts Fan Co..... 60
Michigan Pipe Co. .....Front cover
Mowell, Augustus 8
Mueller Mfg. Co., H..... 12
Narowetz, Louis 11
Nonpareil Air Filters..... 62
Peerless Rubber Co..... 9
Pierce, Butler & Pierce Mfg. Co., Back cover
Richardson & Boynton Co..... 66
Ross Valve Mfg. Co.....Front cover
Safety Cylinder Valve Co..... 6
Simmons Co., John....Inside front cover
Standard Thermometer Co..... 8
Sturtevant Co., B. F..... 61
Thomas & Smith 14
United States Radiator Corporation. 54
Vacuum Ventilator Co..... 56
Warren Webster & Co..... 10
Watson & McDaniel Co..... 57
Wyckoff & Son Co., A..... 6
Zellweger & Son, J..... 11

A Catalog Worth While!

THE most complete boiler and radiator catalog ever issued by any manufacturer, showing six distinct types of UNITED STATES Boilers and six different styles of UNITED STATES Radiators, with a complete line of UNITED STATES Specialties.

Just think of it, six distinct styles of boilers, including round and square patterns, with capacities in steam ranging from 250 to 8,550 feet and in water from 450 to 14,100 feet, and **every rating guaranteed.**

Radiators in six different styles, all usual heights and widths, plain and ornamental patterns. You can please the most fastidious owner by installing UNITED STATES Radiators. There is nothing lacking in style, finish and durability in them.

Our line of Specialties is new and unique; they give the finished touch, the right balance to a good job.

It has taken months to compile this book; it contains text and tables that are valuable for you. Have you a copy? If not, write to-day.

UNITED STATES RADIATOR CORPORATION

GENERAL OFFICES. DETROIT, MICH.

(Branches in principal Cities)

TRADE AND MISCELLANEOUS NOTES

Coming Events

June 6-8, 1911. Third annual convention of the National District Heating Association at Pittsburg, Pa. Headquarters will be at the Fort Pitt Hotel.

June 13-15, 1911. Annual convention of the National Association of Master Plumbers, Galveston, Texas. Headquarters at the Tremont Hotel.

June 27-30, 1911. Semi-annual (midsummer) meeting of The American Society of Heating and Ventilating Engineers on Lake Michigan. Members and guests assemble at Chicago, June 27, and embark on lake steamer "Carolina."

Deaths

A. T. Hoyt, a heating engineer of Warren, O., died March 19. He was 65 years old. Mr. Hoyt was known to members of the American Society of Heating and Ventilating Enginers through a paper he presented at the Detroit meeting in 1904, in which he described what he termed a vacuum hot-water heating system for a greenhouse.

George W. Fels, president of the Economy Gas Heater Co., Cincinnati, O., died at his home in that city March 30. He was 61 years old. He is succeeded bv his son, Clifford Fels.

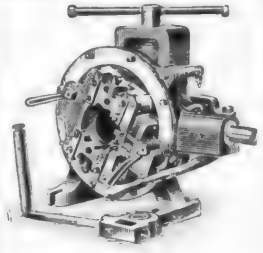
Capt. A. C. Ford, managing director of the Citizens' Mutual Heating Co., Terre Haute, Ind., died at his home in that city March 30. He was 72 years old. He is succeeded by Henry Meyer, president of the Terre Haute Pure Milk Co.

Ludwig Wolff, president of the L. Wolff Mfg. Co., Chicago, died at his home in Chicago, April 14, in his 76th year. He is survived by five sons and one daughter.

Manufacturers' Notes

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., has opened a branch office in

ROBERT A. KEASBEY CO.
HEAT AND COLD INSULATING MATERIALS
85% Magnesia and Asbestos Pipe and Boiler Coverings
CORK COVERINGS FOR BRINE PIPES, ETC.
ESTIMATES FURNISHED AND CONTRACTS EXECUTED
"RAKCO" BRAND ASBESTOS, FLAX AND RUBBER PACKINGS
For all classes of Marine and Stationary Engines and Pumps
100 North Moore Street NEW YORK CITY
Telephone, 6097 Franklin


Catalogue Mailed on Request

ARMSTRONG No. 00 PIPE MACHINE
CUTS OFF AND THREADS PIPE
From 1 Inch to 4 Inches
TO BE USED FOR EITHER HAND OR POWER
Manufactured by
THE ARMSTRONG MFG. CO.
321 KNOWLTON STREET
BRIDGEPORT, CONN.
NEW YORK CHICAGO

Cincinnati, in the Fourth National Bank Building. William Grier is in charge.

Consolidated Engineering Co., Chicago, Ill., announces the election as vice-president of Edward B. Gordon, to succeed John F. Hale, who has become associated with Warren Webster & Co., at Camden, N. J.

Junkins Bros., 80 White street, New York, will hereafter act as sales agents for the complete line of steam heating specialties heretofore sold by the Positive Differential System Co., New York.

United States Radiator Corporation announces the removal of its general offices from Dunkirk to Detroit, by special train, April 19. The new offices in Detroit will be located in the Dodge Building, Jefferson avenue and Brush street. These offices will be only temporary, being used until such time as the new building is completed in which the company's permanent offices will be located. The advantages of a location in Detroit will enable the corporation to handle its business more quickly and accurately.

National Radiator Co., Johnstown, Pa., is completing improvements and extensions to its recently?purchased plant at Trenton, N. J., and the plant is expected to be ready for operation by the middle of June. Charles N. Tull will be in charge.

American Radiator Co., Chicago, it is said, has purchased a tract of land in Bayonne, N. J., at Forty-ninth street, between the tracks of the Lehigh Valley Railroad and New York Bay, on which, it is further rumored, it will build a plant that will enable the company to manufacture its product at tidewater.

Fire Retaining Heating Co., Dayton, O., recently incorporated to manufacture furnaces and other heating apparatus, announces an increase in its capital stock from $5,000 to $500,000.

Joseph Dixon Crucible Co., Jersey City, N. J., announces the appointment of Sherman Paris in its advertising department, succeeding H. S. Snyder.

Central Foundry Co., New York, which has been for some time in the hands of a receiver, has been sold by Receiver Waddill Catchings, on order of the court, to Frederick H. Buss and Daniel A. Hohmann, for $1,659,500. This includes all its properties and interests, excepting the Central Radiator Co. The unsecured claims against the company amounted to $4,222,600.

Continental Radiator and Foundry Co., St. Louis, Mo., is planning to build a new foundry for the purpose of manufacturing cast iron radiators on a scale of from 3,000,000 to 4,000,000 sq. ft. a year. The new building and equipment is estimated

Where Is There a Heating and Ventilating Engineer

who wishes to find a ventilator which will produce a positive draught no matter from which direction the wind blows, which will prevent a down draught and at the same time exhaust twice as much air per hour as any other gravity ventilator?
If he will write to us we will send him a booklet describing the "Vacuum" which will do all of these things and more too.

THE VACUUM VENTILATOR COMPANY
421 Atlantic Avenue **Boston, Mass.**

Richard Warren Chapman

Continuous Jointless Pipe Covering
Asbestos and Magnesia Products

Radiator Shields
Fans and Coils
Air Washers

Monadnock Block
CHICAGO

to cost $75,000. The company's present foundry is located at South St. Louis.

Illinois Blower Co., Chicago, has opened quarters at 119 West 35th street, and will engage in heating and ventilating engineering, with special reference to blower installations. W. B. Crawford, for several years with the Garden City Fan Co., is manager.

Sloan Valve Co., Chicago, has increased its capital stock from $30,000 to $75,000.

Kelly & Jones Co., Pittsburg, Pa., is building a new plant at Greensburg, Pa., to cost $80,000, which will materially increase its capacity for the manufacture of pipe, valves and fittings. The new building will be 395 ft. long by 62 ft. in width, and will contain 98,600 sq. ft. of floor space.

C. A. Dunham Co., Marshalltown, Ia., manufacturers of the Dunham system of vacuum steam heating, has purchased the holdings of the National Vacuum Heating Co., which was the sales agent for the Dunham Company. The two companies have always been closely associated.

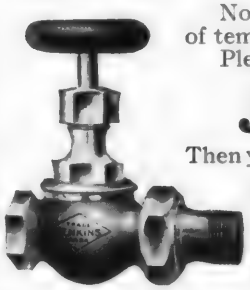
Jenkins Bros., New York, the well-known manufacturers of valves and packings, announce their removal to new quarters at 80 White street, between Broadway and Lafayette street. In a special announcement notifving the trade of the change, the company states that "after doing business for 30 years in one place, we will, on April 17, 1911, move for one reason—that our business has entirely outgrown the accommodations afforded by the old building, 71 John street. While we cannot leave the old business home without a sentimental regret, we are looking forward with pleasure to the increased facilities afforded by the much larger building, 80 White street, where we will be ready to met our old friends with wonted pleasure and the wish and hope of enlarged business for them and ourselves by the increased facilities, together with a constant striving on our part to render a more perfect business service."

Pressed Radiator Co. of America, Pittsburg, Pa., announces the removal of its New York office to its old quarters in the Brunswick Building, 225 Fifth avenue.

Business Changes

Walker & Chambers, engineers and contractors for heating and ventilating, announce the removal of their offices to 222 East 41st street, where they have combined their office, steam fitting and sheet metal works.

PERFECT SERVICE DEPENDS UPON THE VALVE



No matter how fine the system, a leaking valve makes regulation of temperature impossible.

Please your clients by specifying the **genuine**

Jenkins Bros. Valves

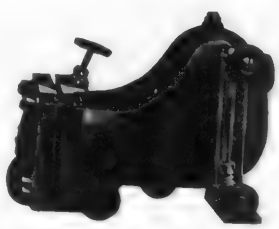
Then you are assured of receiving valves which are thoroughly reliable, absolutely guaranteed, and ultimately the most economical. Send for our catalogue. It will be mailed free on request.

JENKINS BROS.

NEW YORK BOSTON PHILADELPHIA CHICAGO

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

Watson & McDaniel Co.

160 North 7th Street - PHILADELPHIA, PA.

Send for Catalogue

James Smyth Plumbing and Heating Co., Spokane, Wash., has purchased a plot of ground at Post street and Second avenue for $80,000, on which it will erect a new building.

Miscellaneous Notes

Montpelier, Vt.—A drain has been put in from the air duct at the east end of the State House to the waste pipe near the street. The duct is a part of the new heating and ventilating system that was put in last winter, but which has frequently been found filled with water.

Syracuse, N. Y.—The plant, franchises, equipment and all real and personal property owned by the Municipal Heating Co., of Syracuse, covered by a mortgage that was made to protect a bond issue of $300,000 in January, 1902, were sold under mortgage foreclosure proceedings April 25, to Ernest I. White. Mr. White's bid was $5,000. It is said that tentative plans have been made for the organization of a new company to take over the plant. The Municipal Heating Company has done no business in the last year. The company tried to obtain a lighting franchise and when it failed in this, it closed its heating contracts and has been idle since June of last year.

Milwaukee, Wis.—That city factory inspectors may legally be refused admission to the theatres while a performance is going on and that such places of entertainment cannot rightfully be classed as "working places" was the opinion of Judge Neele B. Neelen, in District Court, recently when the case against James A. Higler, manager of the Majestic Theatre, came up. Two factory inspectors alleged that when sent to the theatre on March 6 by the health inspector to look for persons violating the spitting ordinance and to inspect the ventilators, they were refused admittance. The case was dismissed.

Citizens' Mutual Heating Co., Terre Haute, Ind., will build a new power house 60 by 75 ft. to contain two 400 H. P. boilers and auxiliary apparatus.

Francis H. Wiswell, formerly of the International Heater Co., Utica, N. Y., has been elected vice-president of the Mohawk Valley Heating Co., of Utica.

R. J. Gross, president of the United States Radiator Corporation, has been spending some time in Porto Rico, with a party of friends.

Frederick W. Herendeen, associate sales manager of the United States Radiator Corporation, accompanied by Mrs. Herendeen, is on a trip to Los Angeles, Cal.

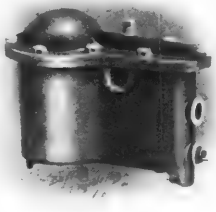
Modern Science Club, Brooklyn, N. Y., at its annual meeting, April 11, elected as president James A. Donnelly, president of the Positive Differential System Co., of New York.

St. Louis, Mo.—Undaunted by the failure of its bill providing for the proper heating and ventilating of the street cars passed at the last session of the Municipal Assembly, the Civic League will present another bill for the same object. The bill will specify heating devices that

SPARE YOUR TOOLS

By using Dixon's Pipe-Joint Compound on joints. No damage to tools or fittings then when you want to open joints.

JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J.



The Empire Low Pressure Steam Trap

Means Trap Satisfaction

The trap question will be settled if you install an EMPIRE. Adapted to all classes of low pressure work. Perfectly automatic in operation. THE SIMPLEST TRAP MADE. Let us send you one on trial. You will be surprised at its low cost too.

ASK FOR BULLETIN 101

AMERICAN DISTRICT STEAM COMPANY

LOCKPORT, N Y. CHICAGO, ILL.

will meet the tests required by the United Railways Company and the Board of Public Improvements.

New Incorporations

Warren Water Heater Co., Minneapolis, Minn., capital $25,000. President, P. G. Speakes; secretary, C. L. Ward.

New York Heater & Supply Co., Jersey City, N. J., capital $50,000. Incorporators: William H. Goff, Norman E. Wiggins and M. E. Duanne. The company is to engage as mechanical engineers, brass founders, boiler makers, etc.

Frank Miller Plumbing & Heating Co., Toledo, O., capital $100,000. Incorporators: Frank Miller and others.

West Chester Heating Co., West Chester, Pa., capital $5,000.

John F. Leary Co., Little Falls, N. Y., capital $25,000, to conduct heating and plumbing business. Incorporators: John F. Leary and Edward J. Walsh.

Eagan Bros. Co., Toledo, O., incorporated to take over business of Eagan Bros., heating and plumbing contractors. Incorporators: Michael R. Eagan, president; B. P. Lyon, vice-president; W. R. Hodge and Conrad Weil.

Thomas C. Rich Co., Omaha, Neb., capital $10,000, to conduct a heating and plumbing business.

International Automatic Valve & Supply Co., Chicago, capital $25,000.

Ohio Valley Brass & Iron Co., Wellsburg, W. Va., capital $75,000, to manufacture steam goods and plumbing specialties.

P. J. Flannery Co., New Britain, Conn., capital $50,000, to manufacture heating and plumbing specialties. Incorporators: Thomas F., Grace A., James F., Mary A., John H., William J. Flannery and Anna Flannery Ruep.

Sanitary Gas & Heating Co., Wilmington, Del., capital $125,000, to deal in water heaters and gas radiators. Incorporators: W. Taylor Birch, M. R. Rodgers and Stewart Ellis, all of Washington, D. C.

Washington Plumbing & Heating Co., Tacoma, Wash., capital $50,000. Incorporators: F. McHugh, William J. Purtell and Wesley Lloyd.

American Heat & Power Co., Oakland, Cal., capital $100,000. Incorporators: J. A. Craig and J. H. King, of Oakland, and J. H. Becker, of San Francisco.

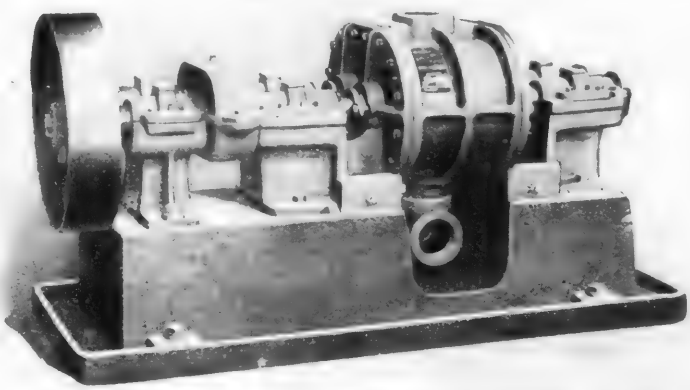
Selman Plumbing & Heating Co., Birmingham, Ala., capital $15,000, to engage in contracting business and to deal in heating, plumbing and electrical specialties. Incorporators: J. A. Selman, William C. Lebo, Frank H. Potter and F. B. Carpenter.

THE CONNERSVILLE VALVELESS VACUUM PUMP

FOR VACUUM HEATING PLANTS

Takes less power than other types. Can be driven by motor, either through belt or gear and pinion. Returns the water direct to low-pressure boiler, thus doing away with boiler feed pump.

For ECONOMY and EFFICIENCY specify the "CONNERSVILLE"



THE CONNERSVILLE BLOWER CO., CONNERSVILLE, INDIANA

114 Liberty Street, NEW YORK CITY 929 Monadnock Block, CHICAGO, ILL.

Contracts Awarded

T. J. McQuellon, Peoria, Ill., heating and ventilating new Douglas School at that place for $8,832. The plumbing contract went to Dooley & Bruninga at $6,880.

L. Luderbach, Jackson, Miss., heating and electric work for the Mississippi Charity Hospital, at that place. The contract amounts to $16,000.

Hackney Ventilating Co., St. Paul, Minn., ventilating system for the First National Bank and Western Union Building, Duluth.

Tow, Defendorf & Bruff, Rochester, N. Y., heating and ventilating buildings at Exposition Park, Rochester. The contract amounts to $16,619.43.

Reliance Heating Co., Pittsburg, Pa., heating five-story Keenan Building at Grant and Sixth avenues; also heating new office building of the American Bridge Co.

Huey Bros., Boston, Mass., heating and ventilating Mary Lyon School Building, Boston, for $6,087.

Wittman, Lyman & Co., San Francisco, Cal., heating, plumbing in the six-story building for F. A. Daroux on Jones street, for $8,340.

Downey Heating & Supply Co., heating and ventilating new Twenty-second District School, No. 4, for $2,680.

Healy Heating & Plumbing Co., St. Paul, Minn., heating, ventilating, lighting and elevator installation in new laundry building at the city and county hospital, that city, for $6,195.

Allen, Myers & Co., Rock Island, Ill., steam heating, plumbing and gas fitting for the new Rock Island Savings Bank; also steam heating and plumbing for Central Presbyterian Church.

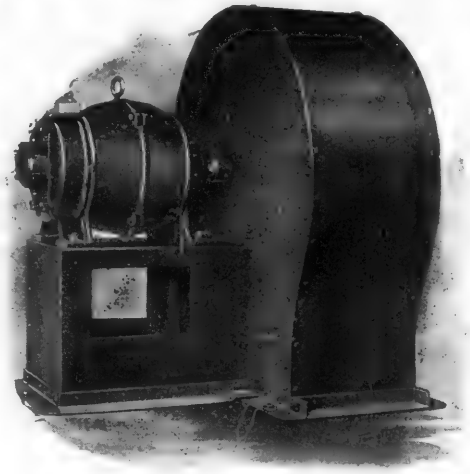
D. E. Burke, Pueblo, Col., heating and plumbing new Pueblo county court house for $48,000. A hot-blast heating system will be installed.

Buffalo Forge Co., Buffalo, N. Y., reports recent orders for mechanical draft apparatus from the Cambria Steel Company, Johnstown, Pa., American Smelting & Refining Co., New York; The Burgess Sulphite Fibre Co., Berlin, N. H.; Knickerbocker Portland Cement Co., Hudson, N. Y., and several export orders from its agents in Germany, Japan and South America. The company reports the export business as particularly active so far this year and with excellent prospects of exceeding that of any former season.

G. H. McLean Co., Springfield, Mass., heating plant equipment for the new $78,000 central station heating plant, which the city of Springfield is building for its municipal group of buildings.

MASSACHUSETTS FANS

ACCEPTED BY ALL—PREFERRED BY MANY



Remember, when planning an installation that the final judgment of your work will rest on ALL the details.

The fans are an important actor.

Let us help you with advice —which is free—and modern apparatus and good workmanship—which are cheapest in the end.

Our Perpetual Catalogue is a Text Book on handling Air—Send for one.

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SEATTLE, Hallidie Machinery Company | BIRMINGHAM, Le Sourd & Turner

Business Troubles

Thomas F. Cushing Co., 451-455 West 125th street, New York, dealers in pipe, filed a petition in bankruptcy April 19 last, with liabilities scheduled at $73,816 and nominal assets at $153,013. The company was incorporated in 1905 with a capital stock of $150,000. It is stated that the founder and president of the company, Thomas F. Cushing, is confined to his home, unable to attend to the business and that the company is without a managing head.

Home Heating Co., Anderson, Ind., has failed and Flavius Jackson has been appointed receiver on application of the Anderson Trust Co., which holds a $15,000 mortgage on the plant. The plant will be sold.

New Work

Columbus, O.—As the result of a report on the heating system of the Franklin county court house, made by a special committee of architects, composed of Fred W. Elliott and William H. Tremaine, an entirely new system of vacuum heating, with ventilation, will probably be installed. The work will amount to $8,000.

Peoria, Ill.—The trustees of Bradley Institute have engaged M. W. Whitmeyer as architect and C. O. Poppin as mechanical engineer, to design a new power plant for the institute, to cost $65,000. It will include a new heating and lighting system. The building will be 90 by 70 ft. and will be two stories high.

Salt Lake City, Utah.—The Board of County Commissioners is arranging for a new ventilating system for the county infirmary.

Manhattan, Kan.—A new heating plant will be installed at the State Hospital. The work is being designed by President Waters, of the Agricultural College; E. B. McCormick, dean of engineering, and L. E. Conrad, professor of civil engineering.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work: Until May 25, 1911, for the construction, including plumbing and ventilation, gas piping, heating apparatus, electric conduits and wiring of the United States Postoffice and Custom House at San Diego, Cal.

Trade Literature

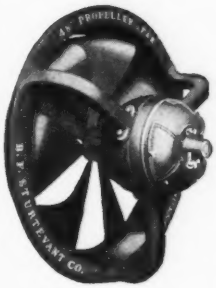
Autoforce Ventilating System, Boston, Mass., has issued an interesting circular of fac simile testimonials received from

THE REMEDY

FOR THAT HOT AND STIFLING ROOM
IS A

Sturtevant

PROPELLER FAN
(Electric or Pulley)



¶ They increase output, reduce sick leave, and raise efficiency of workers by keeping the air fresh and cool.

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¶ The scientific construction and design of the fan blades makes possible the moving of immense volumes of air at small expenditure of power.

¶ These fans are invaluable for use in workrooms, offices, kitchens, billiard halls, and in all places where heat, smoke or fumes are to be removed.

Our engineering staff are always ready to make suggestions if you will inform us of the conditions to be met, the size of the room, etc.

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Hyde Park, Mass.

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those using this method of automatic ventilation. A number of illustrations are added showing Autoforce ventilators in operation in various classes of buildings, including mills, hotels, and churches.

Cochrane Steam-Stack and Cut-Out Valve Feed Water Heater and Receiver and its operation is illustrated in an ingenious model now being distributed by the Harrison Safety Boiler Works, 3189 North 17th street, Philadelphia. The model, which is made of stiff celluloid, illustrates neatly the fact that when the heater is cut off from the exhaust steam supply the separator attached to and forming a part of the heater continues to furnish exhaust steam, purified of oil, to the heating or drying system, while the trap is cut off from communication with the heater, but still continues to drain the separator. Communication between the separator and the heater and between the trap and heater is controlled by two semi-rotary or Corliss valves. In the case of the steam value, the opening is quite large, and the valve when closed receives the pressure not only of springs, but also of the back pressure carried on the engine. Inasmuch as this pressure, multiplied by the large area, might create sufficient friction to render the opening difficult, the valve gear is so arranged that while both valves are opened from one handle, the small valve between the trap and the heater opens first, letting pressure from the exhaust line into the heater to balance the pressure on the steam valve, which is next opened by continuing the motion of the handle. In closing the valve, a similar process is carried out,—that is, the larger valve closes before the small valve has entirely cut off communication between the exhaust steam line and the interior of the heater. The proper timing of the motions is secured by correcting the cranks attached to the respective valves. The link, however, is slotted, permitting the smaller valve a certain excess of motion after the larger

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Trouble with Vacuum Heating Systems is in the Automatic Valves

Automatic Valves are Unnecessary with the
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Containing Particulars with Illustrations

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valve has come to rest in closing and before it begins to move in opening. Upon the reverse of the model it is stated that full particulars regarding the application of these heaters in connection with all kinds of exhaust steam heating systems are fully explained in the "Exhaust Steam Heating Encyclopedia," published by the manufacturer, which, with the model, is sent gratis to persons who are interested in the design, installation or operation of exhaust steam heating systems, and who state the name of the concern with which they are connected and the use at present made of the exhaust steam.

United Vacuum Appliance Co., New York, has issued an attractive 32-page catalogue in which vacuum cleaning systems are exhaustively discussed. Some remarks are also included on the engineering features of air moving, including a discussion of the best methods of carrying dust by means of air and of producing a vacuum. The pamphlet points out the advantages of the Connersville valveless positive pressure blower for vacuum cleaning systems, and includes some test curves showing its power consumption as compared with other types of units. The tables on air velocity and pipe equalization, as well as other tables for converting units, will be of assistance to architects and engineers in laying out and specifying central vacuum cleaning systems.

BOOKS ON HEATING AND VENTILATION

Heating and Ventilating Buildings, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Fifth edition, largely rewritten. 577 pages. 277 Ills., 8vo, cloth. $4.00.

Baldwin on Heating; or Steam Heating for Buildings By William J. Baldwin. Fifteenth edition. Revised and enlarged. 391 pages. 131 figures. Size, 5x7¼ in. Contains descriptions of steam heating apparatus for warming and ventilating large buildings and private houses, with remarks and tables. Cloth, $2.50.

Handbook for Heating and Ventilating Engineers. By Prof. James D. Hoffman and Benjamin F. Raber. The latest book on this subject. Unusually comprehensive. 320 pages, with 45-page appendix. Size 4½x6¾ in., bound in flexible leather. Price, $3.50.

Questions and Answers on the Practice and Theory of Steam and Hot-Water Heating. By R. M. Starbuck. Illustrated. $1.00.

Ventilation of Buildings. By William G. Snow and Thomas Nolan. 83 pages. Pocket size. Contains a statement of the general principles of ventilation and of their application to different kinds of buildings. Boards, 50c.

Steam Heating and Ventilation. By Wm. S. Monroe. Containing formulas and data valuable in the designing of heating and ventilating plants. Price, $2.00.

Air-Conditioning. By G. B. Wilson. Being a short treatise on the humidification, ventilation, cooling and the hygiene of textile factories—especially with relation to those in the U. S. A. With figures. 12mo. Illustrated. 143 pages. Price, $1.20.

Steam-Electric Power Plants. By Frank Koester. A practical treatise on the design of Central Light and Power Stations and their economical construction and operation. 473 pages. 340 ills. Price, $5.00.

Light, Heat and Power in Buildings. By Alton D Adams, M. E. The purpose of this volume is to present in compact form the main facts on which selection of the sources of light, heat and power in buildings should be based. The problem is to determine the kind of equipment that will yield the service required at the least cost. 12mo. Cloth, $1.00.

Practical Steam and Hot Water Heating. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

Dean's System of Greenhouse Heating, by steam of hot water, with formulas for obtaining different temperatures, by Mark Dean. Price, $2.00.

Power, Heating and Ventilation. By Charles L. Hubbard, B.S., M.E. A treatise for designing and constructing engineers and architects. The whole subject of heating is covered, including the heating of large institutions with central plants. Space is also devoted to electrical matters connected with steam plants. 647 pages. Price, $5.00 (three volumes in one).

Hot-Water Heating and Fitting. By W. J. Baldwin Fourth edition. Price, $4.00.

Steam Fitters' Computation and Price Book, abridged. By Mark Dean. Price, $2.50.

Practical Treatise Upon Steam Heating. By F. Dye. Embracing methods and appliances for warming buildings, etc. Low pressure, high pressure and exhaust steam. 8vo, cloth, illustrated. Price, $4.00.

The School House. Its Heating and Ventilation. By J. A. Moore. 204 pages, illustrated. $2.00.

A Manual of Heating and Ventilation, for engineers and architects, embracing tables and formulas for dimensions of pipes for steam and hot-water boilers, flues, etc. By F. Schumann. Second edition, revised and enlarged. 12mo, $1.50.

German Formulas and Tables for Heating and Ventilating Work, especially adapted for those who plan or erect heating apparatus. By Prof. J. H. Kinealy. Illustrated. Price, $1.00.

Tables for Calculating Sizes of Steam Pipes. By Isaac Chaimovitsch. A manual for the determination of steam pipe sizes for low pressure heating. 48 pages. 4 insert tables. Price, $2.00.

Centrifugal Fans. By J. H. Kinealy. A theoretical and practical treatise on fans for moving air in large quantities at comparatively low pressures. 206 pages. 39 diagrams. Full limp leather pocketbook round corners, gilt edges. Price, $5.00.

The Principles of Heating. By William G. Snow. A practical and comprehensive treatise on Applied Theory in Heating. 161 pages. 42 illustrations. 38 tables. Size, 6x9 in. Cloth, $2.00.

Modern Sanitary Plumbing, Steam and Hot Water. By James J. Lawler. 400 pages. 228 illustrations. Size, 6x9 in. This is the latest edition of Mr. Lawler's well-known work on this subject Price, $5.00.

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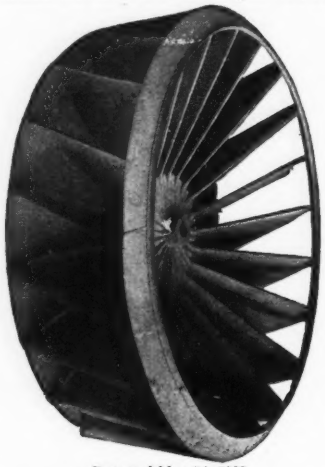

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This is a tile conduit, salt-glazed inside and out. Is absolutely watertight.

Acids, gases or the action of the earth do not affect it. Neither can it be injured by weight or movement of pipes. Practically indestructible.

Easily opened after installation. Can even be taken up and relaid. The most efficient conduit for conveying steam, gas, water, brine or other liquids under ground.

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